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The AUTOMOBILE

Lighting Systems Simplified

Standard Lighting and Starting Equipment for 1916 Is Lighter, Simpler, Neater and More Efficient —Better Wiring—Oiling Only Attention Needed

By A. Ludlow Clayden

LIGHTING and starting systems, of which there are many makes, divide naturally into main divisions. First come those which hold between them the great bulk of the car manufacturers' business; second, are many more which share with some of the former the growing trade in equipments for Ford cars and old vehicles which were sold originally without any electric equipment. In the following the first class will be considered, though the general remarks apply to both fields to a very great extent. The second class of instrument is frequently as interesting from the viewpoint of its method for attachment as from that of its electric system, and this class will be considered in a later review.

Still Enormous Variety

Being the newest portion of the automobile chassis it is natural that the lighting and starting system should be the furthest from a settled form. Both electrically and mechanically there are still many systems of construction, there is little agreement between one manufacturer and another, and it is difficult to trace any definite trends except in a very broad way.

One definite thing which is more distinctly traceable this year than it was last, is the growth in popularity of the two-unit system. There are a few notable exceptions, but it is the opinion of the majority of manufacturers of generators and starting motors that the two-unit for large cars is a settled type. For small cars, cars of which the engines are sufficiently small not to need much electric power for starting, the single unit is cheaper and is giving satisfactory service.

Another striking point is the gradual elimination of "controls." At one time it was a common idea that some regulation was necessary so that the difference between summer and winter conditions could be met. For instance there are some systems which allow the generator to be set to cut in and start charging at a lower engine speed for winter work. Now only quite a few of these remain, since it is found that a system which will give all the current needed for winter driving will not overproduce to a harmful extent in the summer.

Next in order of development may be put a general mechanical simplification, which brings in its train some reduction in weight.

Starting Motor Drives Simplified

There are hardly so many methods in use for connecting the starting motor of a two-unit system to the engine. Practically the Bendix pinion reigns supreme in every instance where the toothed flywheel is employed and there is no additional gear reduction between the crankshaft and the armature shaft of the motor. The success of the Bendix pinion is a remarkable instance of what can be accomplished by a timely invention; certain small drawbacks found with the first installations have been overcome, and at present the magnetic and other forms of pinion shift find extremely little favor, though they have each special points of advantage.

Too Many Patterns

There is still a ridiculous number of shapes and sizes and patterns for generators and starting motors, not because of the numerous makes, but on account of the multifarious patterns made by each manufacturer, in the majority of instances. Time will cure this, of course, since the present state of affairs is uneconomical, bad for the electrical firm, bad for the automobile manufacturer, bad for the user and terrible for the repair shop men. It makes for inefficiency all along the line.

The cause for the state of affairs is twofold. First, the electrical specialists had to make many large scale experiments, and it is only lately that the two or three best electrical constructions have been decided upon. Secondly, automobile manufacturers called for generators and motors of such and such dimensions to suit their engines and their chassis, and the electrical manufacturers did not hesitate to produce a "special model" to meet the detail requirements of each car builder.

The worst of this chaos is over and another couple of years will see the situation in a properly standardized condition, probably with the help of the S. A. E. which will be forthcoming as soon as everyone agrees that the time is ripe.

Starting and Lighting Systems Forming Standard Equipment Upon 1916 Cars

Westinghouse	Delco	Remy	Gray & Davis	Bijur	Aplco	Dyneto	Auto-Lite	Disco	U. S. L.	Allis-Chal.	Wagner	Bosch	Detroit	Leece-Nev.	Simms	North East
Allen	Auburn	Auburn	Chalmers	Apperson	Arbens	Detroiter	Chevrolet	Argo	Dispatch	Grant	Moline-Knt.	Marmon	Ross	Haynes	Maxwell	Dodge
Barley-Halladay	Buick	Inter-State	Chandler	Farmack	Briscoe	Franklin	Empire	Bell	Mercer	Partin-Palmer	Studebaker	Simplex	Saxon			
Biddle	Cadillac	Madison	Lozier	Hupmobile	Cameron	Harvard	Jackson	Crow-Elk.								
Case	Cole	Oakland	Metz	Jeffery	Elkhart	Regal	Overland	Mecca								
Daniels	Davis	Partin-Palmer	Morse	Packard	Herff-Brooks	Chalmers	Willys-Knt.	Monitor								
Dorris	Moon	Reo	Paige	Scripps-Booth	Luverne	Spaulding										
Dort	Oakland	Stutz	Peerless	Winton	Wayne-Richmond											
Enger	Oldsmobile	Velie	Velie													
Glide	Paterson															
Kissel	Pathfinder															
Lexington	Pilot															
Locomobile	Premier															
Marion	Republic															
McFarlan	Westcott															
Mitchell																
National																
Pathfinder																
Pierce-Arrow																
Pilot																
Pullman																
Singer																
Standard																
Stearns-Knight																
Stewart																

From the user's viewpoint the weak parts of the electrical equipment are the wiring and the battery. For the latter the user is himself altogether responsible. If the battery is not kept full, and if the hydrometer is not used regularly, trouble is certain. It takes longer to kill a battery by refusing it water than it does to kill an engine by withholding oil, but ultimate death is equally sure in either case.

For the wiring the automobile manufacturer has to take the blame. It is infinitely better than it was a year ago. Wires in armored casings are the rule and wires are generally shorter than of yore. Clearly marked connecting terminals, easily accessible fuses, different colored wires and such aids to upkeep are found on most cars, but it is still possible to see room for improvement. It is becoming recognized that the proper place for all junctions and connections is on the dashboard or the cowl board, preferably the latter, and that all switches and other controls should be brought close together. It is easy to trace a long wire to a lamp or to the battery, but there is danger in a maze of cross connections from switches to fuses, fuses to junction boxes and so on.

However, considering the limited time in which the whole electrical part of the gasoline automobile has been developed the state of comparative perfection reached is very remarkable indeed. It reflects the greatest credit upon the electrical manufacturer, and upon the automobile maker. Apart from the battery and the wiring the next weak spot seems to be the tendency of users either to swamp the generator with oil or not to oil it at all. An armature spindle of a generator needs a little oil, but only a little, and usually it needs that little fairly frequently. Two or three drops is enough for a dose, but a big supply at infrequent intervals is *not* by any means equivalent to a proper oiling at proper intervals.

Next in rules for owners should be "suspect the generator last of all."

First make sure of the state of the battery.

Second, make sure of the tightness of all wire connections.

Third, test for broken wire.

Fourth, see that the switches are operating properly and are not broken or loose.

Fifth (only after the first four are made sure), see if the cut-out is misbehaving, and then—

Sixth and last, there may be something the matter with the generator, though the chances still will be that something has been overlooked in the first four examinations.

All a generator or starting motor needs is to have the commutator cleaned once in a while and the brushes reset or renewed, but this last is not a job for any man who is totally ignorant of electrical machines.

Electric Systems Simpler

The main reason for the reliability of the modern generators and motors is their increased simplicity and much better protection against dirt and moisture. The modern system of insulating by impregnation under heavy pressure and considerable heat has almost made impossible any internal leaks in armature or other windings, and materials have now been found to support the arduous conditions of service of the brushes. Commutator construction has also been improved, this being a purely mechanical problem. On the electrical side, the methods for regulating the current are, on the whole, simpler and more effective. For one thing, such an enormous amount of data is now available that it is easy to determine the output which is necessary for a car of given size. Then, too, the special points of one or another system have been discovered to have specific applications of especial merit; electrical manufacturers have found out how best to meet required conditions of weight, size, cost, etc.

As an example of the sort of problem which has been brought to a less unsettled state, it is found that the current required for lighting a small car is almost as great as for the largest vehicle, while the current needed for cranking is much greater with the larger engine. Thus to make a single unit generator and starting motor is much easier for small cars as the motor part can be small, the generator part needing to be practically of the same power as that required by a large car.

The main systems of regulating the output of generators

Left—Westinghouse combined generator and ignition unit illustrating the remarkable compactness of the new model

Above—Westinghouse starting motor with helical tooth, magnetically operated pinion shift. Below — Westinghouse motor with Bendix pinion and outboard bearing

so as to produce enough, but not too much electrical energy under all the various conditions of speed and loading, were dealt with in THE AUTOMOBILE on Oct. 21, 1915, so there is no object in going over the ground again, as there are no new principles.

The 1916 designs show that the vibrator system for controlling either voltage or current has increased greatly in popularity. Meanwhile the third brush system is likewise popular and there are many machines that utilize the reversed series system, the simplest of all if not the most efficient perhaps.

Bucking coil regulation is less frequently encountered, but it is used for some machines of the highest possible quality.

It seems that we are still a very long way indeed from agreement as to which is the best system of all.

The Westinghouse System

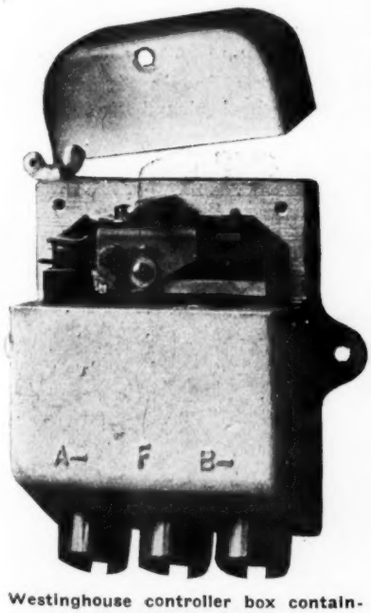
As might be expected the Westinghouse Co., holding such an important position in the electrical world, has not let any grass grow beneath its feet, and as a result Westinghouse lighting and starting systems are to be found on very many cars to-day.

Making a variety of patterns the most popular type for 1916 is the one which uses the vibrator system of control, this machine having a practically constant voltage whether the battery be connected or not. Once start the engine and the battery becomes hardly necessary. The Westinghouse generator is usually a four-pole machine. If for current supply only, the generator is round and has all four poles wound, but if it combines the ignition coil it is rectangular with all windings contained in the upper part and the armature at the bottom. Various sizes are made to suit different cars, but the construction is similar in all.

Single unit Westinghouse systems are made for some special purposes and these operate at 12 volts, but the most usual two-unit systems are all 6 volts.

The Westinghouse company are protagonists of the single wire principle, in which the frame of the car is used as the return for each circuit, and all their machines are made for use with single wires only.

During the past year development has been almost all in mechanical matters connected with the manufacture of the machines; for instance, a much more extended use is now being made of laminations. The field magnets for the generators in many sizes are made up of stampings of sheet iron instead of from castings or forgings, this being the preferred method, both from electrical and mechanical viewpoints, but it has taken some time to lay down the necessary plant to take care of the present large output.



Westinghouse controller box containing voltage vibrator

Commutator and brushes are extra large and are designed to give several years of service without renewal.

The regulator requires no attention whatever except at very long intervals, indeed, but is provided with a voltage regulating screw which can be used by the factory in setting the machine to produce the required characteristic curve of performance.

Right—Two types of Remy starting motor; a Bendix pinion design and a motor with intermediate reduction gearing

Left—Remy generator unit of the 1916 pattern. A very compact machine

For the motor generator and for some special types of two-unit the Westinghouse Co. also make use of the inherent system of regulation and of the bucking coil system, but the vibrator is far the most popular this year. Westinghouse starting motors are supplied in several shapes and sizes for different requirements and for use with either the Bendix pinion engagement for the flywheel or a similar pinion with magnetic control.

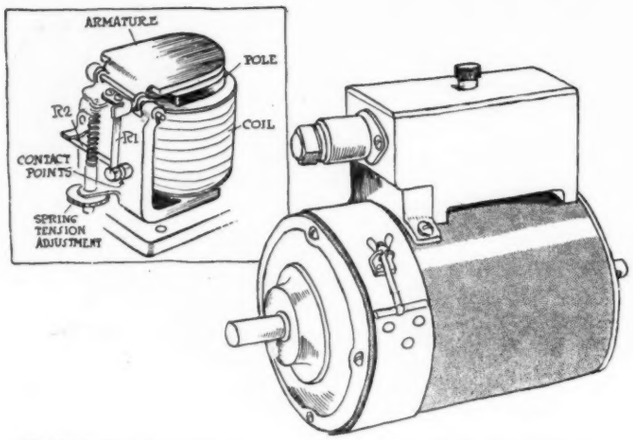
While the Bendix is the most popular the magnetic shift is being used for a few high-priced cars, owing to the fact that it needs but the depression of a button, a much heavier switch action being needed for the other. The magnetic shift motor has an armature capable of moving longitudinally and there is a simple pinion on the flywheel end. This normally overhangs the flywheel gear and has *helical* teeth as has the flywheel ring gear. At the front end of the motor is a little box containing a coil of wire through which passes all the current on its way to the motor, and there is a soft iron end piece on the armature shaft, a spring back of everything keeping the pinion normally out of mesh with the flywheel. When current is switched on, as the pinion starts to move, the current in the end coil sucks the armature forward and meshes the gears.

Now, as soon as the motor reaches a certain speed which is a trifle above cranking speed, the back current generated within the motor greatly reduces the power of the suck on the armature and the spring breaks the pinion out of mesh automatically. The helical teeth make for instant engagement and assist disengagement, since the flywheel tends to throw out the pinion. Further, if the pinion should fail to engage and start to spin the back current prevents the engagement taking place. Either the pinion slips in without a sound or nothing happens, but in practice it is very rarely indeed that engagement fails.

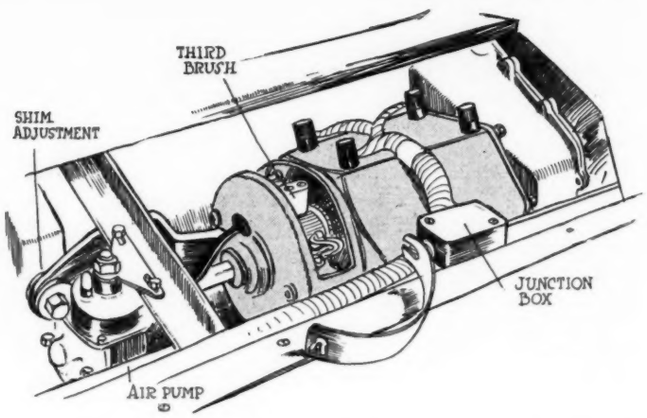
A strong feature of complete Westinghouse equipments is the robust nature of the switches and fuse boxes and other small parts.

Delco Systems Have Strong Hold

The Delco system is usually a single unit, but the name is a misnomer, for the single Delco apparatus would be described more correctly as a compound system. The main advantage of the two-unit system is that the armature of the generator can be geared to suit the crankshaft speed so that it runs



Bijur generator with voltage control mounted on it in sealed box. Also details of voltage controlling vibrator R1 and R2, being the two blades which allow the contacts to vibrate in two directions



Dyneto single unit as applied to Franklin car. It can be seen that there are three brushes and that the wiring connections are simple and accessible

normally at the most efficient rate, which is far less than the rate necessary for starting when the machine is used as a motor. With a constant ratio between armature and crankshaft the armature has to be larger than necessary for generation in order to get enough starting torque. The Delco machine has a single armature with a pinion on the rear end and a drive connection on the front end, but inside the front end there is a roller clutch so that the armature can overrun the engine. If the engine stops the armature can spin on till its own small friction brings it to rest.

Thus, when the current from the battery is turned into the armature it can spin freely without affecting the crankshaft of the engine. When in use as a generator the machine operates quite like any single unit type with inherent regulation. It is but little larger and but little heavier. To use it as a motor for cranking there is a duplex intermediate pinion which can be slid mechanically, like a transmission gear, and this engages simultaneously with the flywheel ring gear and the armature pinion. By an ingenious switch combination the action of depressing the pedal that slides the gear also operates the switch, so meshing is performed and current turned on by one movement.

The effect of using the intermediate gearing, which as the sketch shows is in itself a reduction gear, is to give the armature a very high cranking speed, and this is highly desirable from the electrical viewpoint.

Improvements in the Delco system have been progressive for years, but they have not affected the principle, nor have they altered the external appearance very much. Reliability on an increasing scale has been sought by ever better methods of manufacture.

Early in the present year the Delco two-unit system appeared, this being made to suit a particular car which was not readily adaptable to the usual single unit. This two-unit type is to be employed on more than one 1916 car, but the single machine remains the Delco standard. Probably there are few leading firms who concentrate so closely upon a single design as do the Delco and the company is to be congratulated on the fact that its original system has held its place from the very beginning of electric equipment right up to the present moment.

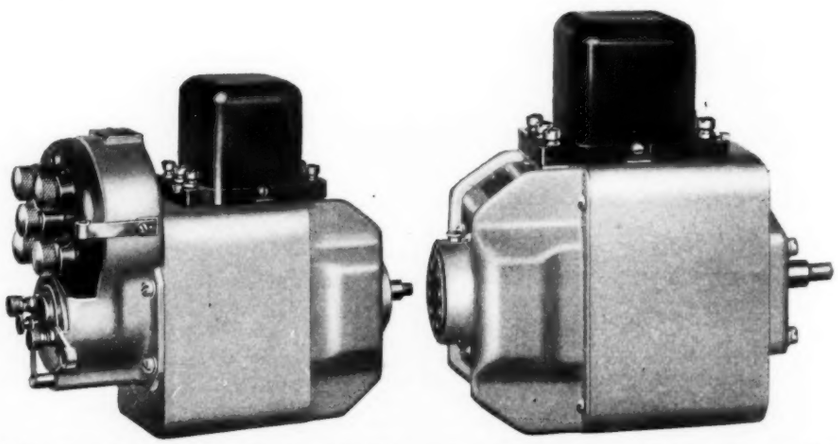
Remy Has New Two-Unit

The principal Remy system for 1916 will consist of a unit generator and ignition system, with a separate starting motor. The generator is regulated by a vibrator, but this is arranged so as to control the current output instead of controlling the voltage. Should the current rise above a predetermined point the magnetic action of the vibrator introduces resistance and reduces the current instantaneously, then as the vibrator lets go again the current rises, only to be cut once more as the vibrator is again pulled open. The action is extremely rapid and the fluctuating current produced has the same effect as a steady current, it is steady to all intents and purposes, the variations being infinitely more rapid than can be detected by any recording instrument. Of course, the voltage varies in just the same way with the other method for linking in the vibrator, the average being steady in just the same manner. The only difference which affects the user is that the current controller type like the Remy generator cannot be used without the battery in circuit as it is the battery which controls and restrains the voltage.

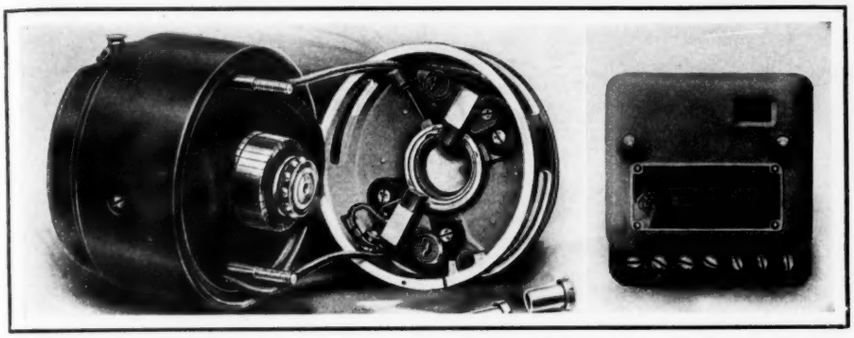
With the Remy arrangement there is a four-pole field magnet with all poles wound, and three brushes are employed.

Externally, the generator is wonderfully compact, the vibrator and the cut-out automatic switch being housed in a small box which is screwed to the generator base. The ignition distributer is mounted on the other end of the machine and the ignition coil stands on a pedestal on top of the field magnets. The system of control allows a high output from a small machine, so the new Remy is light as well as compact.

For the Remy starting motor the Bendix pinion is the standard form of coupling to the flywheel and the motor it-



Left—Gray & Davis generator and ignition unit with regulating vibrator in box on top of field magnets. Right—Gray & Davis generator for separate ignition equipment



Details of brush gear and external view of the control box used with the new Bosch Standard generator set

self is a substantial four-pole machine with plenty of power. The commutator and brushes have been constructed with the intention that they shall operate without needing attention during the life of the car and they are certainly of extremely generous proportions.

Gray & Davis 30 Per Cent Lighter

For 1916 the electrical system of the Gray & Davis machines has not been altered, but substantial changes in the mechanical detail have enabled the weight to be reduced by almost one-third. This reduction is mainly owing to the adoption of a four-pole machine of the roll frame type with pressed steel end caps. In addition to this commendable saving of weight the Gray & Davis reliability has been improved still more by giving great attention to the mounting of the bearings, which are each provided with a large oil container and efficient means for excluding dust or dirt.

Also the accessibility of the brushes has been improved so that by sliding off one side cover both brushes are laid bare for examination.

Both double and single unit Gray & Davis systems are made, the latter being used for small engines and the former for larger types, and a feature is that the machines are designed to operate at a rather lower speed than usual. The generator is controlled by a vibrator linked in so as to control the voltage of the current supplied and this vibrator, together with the automatic cut-out, is mounted in a neat case that attaches directly to the generator itself.

For the starting motor of the two-unit system the Bendix pinion is the preferred drive and the makers claim that the motors they select for the automobiles supplied with their system are capable of cranking at a speed which is above the normal.

Bijur Has Special Regulator

The Bijur equipment was described in THE AUTOMOBILE of Oct. 28, 1915. The main changes for the coming year are that the weight has been reduced and the efficiency increased, the main principle remaining unchanged. Both constant current type generators with inherent regulation and generators with vibrator voltage regulation are made, and the latter type has a special feature which has now been in use for some time, proving very satisfactory. This is the use of a vibrating reed which can vibrate in two directions. Not only does the blade vibrate up and down, as it has to do in order to make and break the contacts, but it is flexibly supported so that it can shake sideways also. The purpose of this is to allow the contact points to meet in all sorts of relative positions instead of always square together, the idea being that this spreads the slight wear and prevents any danger of pitting.

The saving of weight has been brought about by using seamless steel tube to make the outer shell of the machines, the pole pieces being screwed on after the windings are in place. This makes the generators and motors of neat exterior appearance and is frequently of assistance in fitting to an engine. Accessibility is well cared for, but the cut out and voltage regulator on that type of generator are sealed up in a case which is attached to the generator shell. Should any trouble be traced to this portion of the equipment it can be removed as a unit without touching any wires, and replaced with another, the regulator base being of standardized form, and the makers will attend to the faulty apparatus if returned with the seal unbroken.

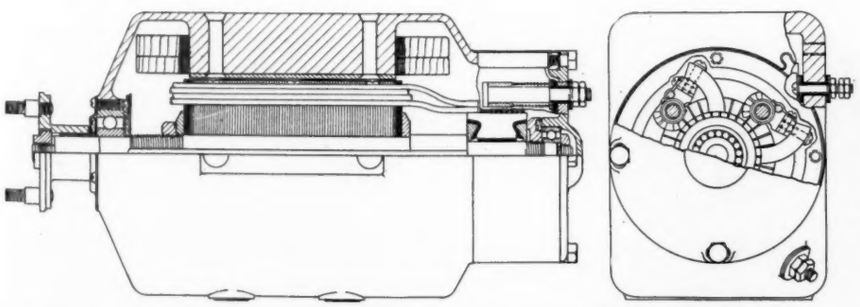
Aplco Single and Two Unit

Made by the Splitdorf Co., the Aplco machines are of both single and duplex type. The motor generator has been developed to a high pitch of perfection and is found on one car in an almost unique position, this being alongside the gearset. When acting as a generator this machine operates at 6 volts and is thus usable in connection with the preferred 6-volt lamp equipment. When acting as a motor the connections are such that 12 volts are supplied from the battery and the starting torque thereby enhanced.

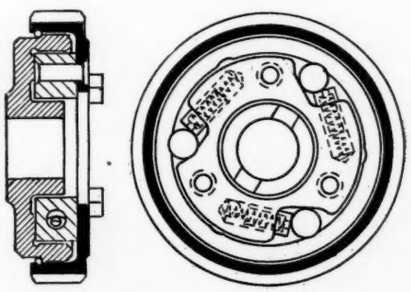
Regulation is performed by a compound winding with reversed series coils and the arrangement is such that both series and shunt windings are used for the starting current. As a single unit machine operating on two voltages it is necessary to have an automatic cut out, and this is part of the equipment. Features claimed as peculiar to this outfit are light weight and high efficiency.

Dyneto Prefers Single Unit

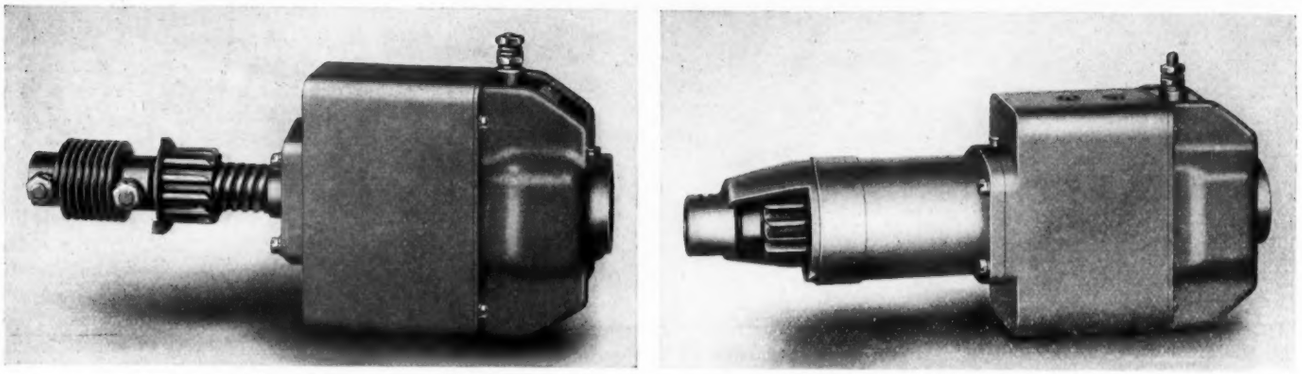
For 1916 there will be available four Dyneto systems, two of the single unit type and two of the double unit. The manufacturers express strong preference for the single unit, believing that its simplicity which is very great, overcomes any other advantages which may belong to the two-unit sys-



The Disco single unit which has as its main feature a very robust design and extreme simplicity. The purpose of the curved brushes shown in the end view is to give square contact with the commutator



Section of roller clutch used on armature drive in Delco single unit equipment shown on page 1002



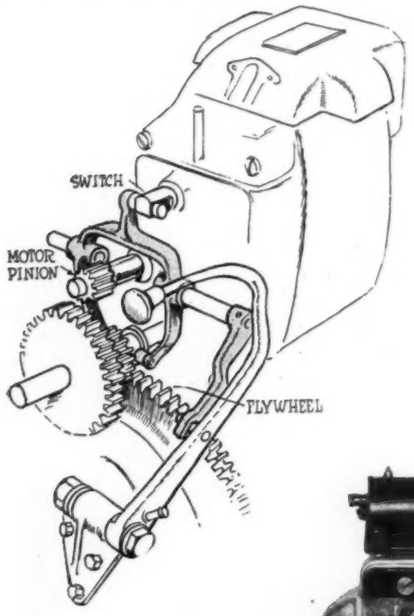
Gray & Davis starting motors with Bendix pinion drive. That on the right is provided with outer bearing for support of shaft extension

tem. Regulation of output is by compound winding with reversed series coils and the voltage is 12. There are no automatic cut-outs so the battery drives the gasoline engine automatically if the latter should stall, recommencing generation directly the engine picks up again. Changes for the coming year have been quite small and center mainly upon means for attaching the single unit machines which have been improved so that the fitting to a variety of different engines is facilitated.

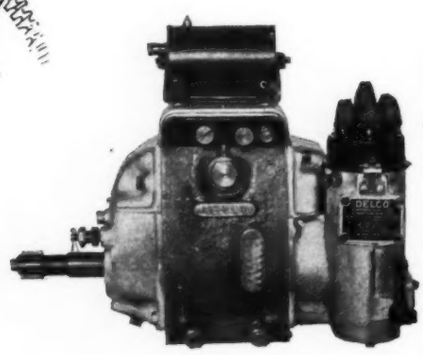
Geared with the crankshaft at from 2.5 to 3 to 1 the starting torque developed is large and cranks the engine at a rapid rate. No attention whatever is needed beyond oiling and occasional adjustment of the chain when this form of drive is used, and it is the recommended drive.

Auto-Lite Have No Novelties

Known, perhaps best of all by reason of the enormous number of systems fitted to Overland and Chevrolet cars, the keynote of Auto-Lite two-unit equipments has been simplicity. For generator control the reversed series winding is employed, this reducing the mechanical attachments to a simple cut-out of ordinary design.



Left—Diagram of Delco single unit system. The switch is operated by the same pedal that shifts the gears into mesh. Below—Delco lighting, starting and ignition unit



The Auto-Lite generator is of very distinctive design, having magnets shaped like those of a magneto with the winding coil concentrated upon the arch of the horseshoe. In the Auto-Lite factory there is an immense press plant for cutting out and shaping parts of sheet metal, and the field magnets are, consequently, made up of laminations like the armature.

This press plant is utilized to the fullest advantage in order to produce the equipments with a minimum of weight and without undue expense, in fact it is a most striking example of how very much manufacture can be simplified by the ingenious employment of pressed parts. Not only are these used for laminations, but switch parts, casings, covers, etc., largely come finished from the press room and need no machining. It is noticeable that practically all machine work in the plant is on small parts like screws and terminals.

No new models are announced for next year, the machines produced twelve months ago being continued. Generators of similar design are made in several sizes and there are several models of starting motor to suit different applications.

Disco Is Single Unit

Two sizes of single unit motor-generator makes up the Disco line at present, but it is expected that a two-unit system will be announced shortly, the company considering that both types will be permanent. Rather an unusual feature for a single-unit machine is the use of a vibrator form of controller which restricts the current output at high speeds and is, of course, cut out entirely when the machine operates as a motor. The Disco Co. draw particular attention to their brush gear which is very accessible for examination, while the brushes can be removed for the purpose of cleaning the commutator at the rare intervals when such attention becomes necessary. It is claimed that the brush wear is extremely slight owing to the excellent commutation, which is assisted by the regulating system.

U. S. L. Only Flywheel Starter

The only flywheel dynamotor now standardized as regular equipment on any well-known automobile is the U. S. L., which was one of the first systems to be produced. For 1916 the system has been improved in detail quite considerably by a large reduction in the number of parts and simplification of detail. In this machine the armature forms the flywheel of the gasoline engine and it is surrounded by the field coils which are, of course, stationary.

Regulation is on the inherent principle and is so arranged that the maximum charging current occurs at a low engine speed, the rate of charge falling off as the speed rises. A special switch is provided by which the current can be cut off altogether for long, high speed runs to prevent the battery receiving an overcharge.

An especial improvement for 1916 is the provision of an

electrically operated relay switch for starting. All switches, fuses and connections are now concentrated upon the cowl board attachment and pressing a small button sends a small current through a relay coil which then operates a powerful magnetic switch and throws on the full starting current. The new device not only removes the necessity for a foot actuated switch, but overcomes any danger of burning the switch contacts, by reason of the instantaneous action of the magnetic switch.

Two Types of Allis-Chalmers

Both single and double unit Allis-Chalmers systems are made, a vibrating reed current controller being employed for both types, and 1916 changes have been mainly along the line of improved mechanical detail and reduced weight. Greater accessibility has been secured through changes in the brush holder and commutator design and weight reduced from 15 to 17 per cent by refinements which permit reduction of waste material.

For detail equipment there is a new cowl board panel upon which all the switches and the ammeter are grouped and this panel also carries every wire necessary except the main leads to battery and lamps. Thus wiring is simplified and the ease of fitting enhanced, while reliability is increased. All the connections to outer circuits are made in the fuse and terminal compartment wherein each connection is clearly marked and tracing any wire consequently made perfectly easy.

Another improved detail is the starting switch which is foot operated. The contacts are heavier and yet the whole part is lighter, and additional protection against ingress of dirt or water is given by a tubular cap which covers the plunger.

Wagner Builds to Order

Wagner starting equipments are not made in standard form but are designed to suit the needs of automobile manufacturers and may vary in detail accordingly. Only two-unit systems are made however, this being practically the only limitation.

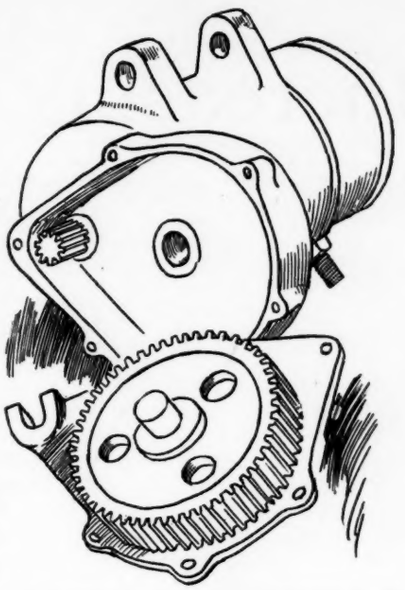
An almost unique feature of one of the best known Wagner outfits is found in the starting motor used on the Studebaker car as this has a double reduction gear. Made integrally with the starting motor is a case containing a pair of steel gears giving a reduction of about 8 to 1, and it is to the spindle of the large gear that the engine drive is connected. This double reduction permits the use of a very high speed, small and light motor.

Bosch System New

As the Bosch system just introduced was described last week in full, there is no need to repeat the account here. The new set is called the Bosch "Standard" and consists of generator, motor and switch unit with a box containing the automatic cut-out separate. Regulation is by ballast coil or hot wire controller and the special features are light weight compared with neat design and fine workmanship.

Leece-Neville

Up to the present no new models of this system have been announced, the standard equipment being that as fitted to the Haynes car. This is a two-unit type, the generator having inherent regulation. The use of a 12-volt potential is now rather unusual with a two-unit system but the Leece-Neville Co. believes that it is possible to obtain higher efficiency from both generator motor with this voltage, so it has been the standard employed and is still being continued.



The intermediate reduction gearing used on the Wagner starting motor fitted to Studebaker cars

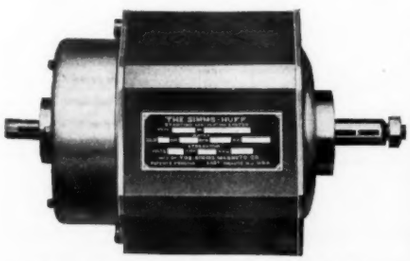
Simms-Huff Continue Single Unit

The unique feature of the Simms-Huff system is that it is a single unit with two connections to the engine. Arranged to be driven by belt or any other approved method it operates as a generator with inherent regulation, charging at 6 volts. When operated as a motor, a 12-volt current is used and an over-running clutch is employed to prevent interference between one drive and the other. Having the ability to operate at a high speed for starting, the weight of the unit is not great, in fact it is extremely small, it being stated that a machine weighing but 30 lb. can exert a starting torque of 24 lb. The brush gear is of ingenious design, only one wire being used to make connection. Being hexagonal in shape the unit is also short, and its compactness allows it to be fitted in a very confined space.

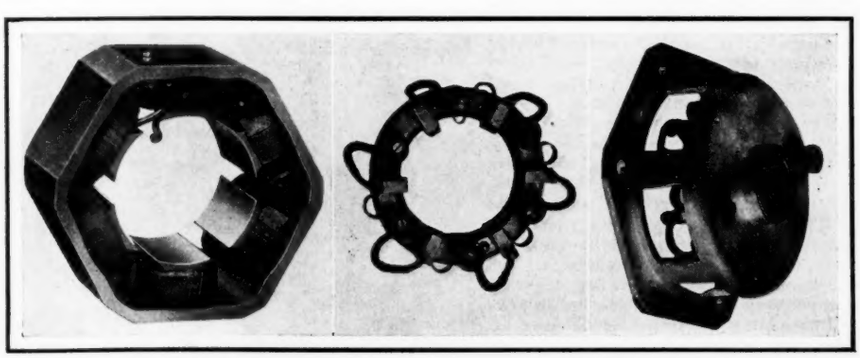
In Conclusion

In concluding this brief review of the most widely used lighting and starting systems it should be again emphasized that it has only been attempted to include those which are employed extensively by automobile manufacturers as standard equipment.

There are a very great many other systems which can be applied to standard modern cars or to old cars, in fact most of the systems which can be bought one at a time are different from those which are used as standard equipment. It is hoped to review these at a later date.



Simms-Huff single unit which is driven at one end and drives for starting from the other



Right—Details of magnet windings and brush gear of Simms-Huff single unit

Increasing Activity in Axle Field

Many Small Changes in Design—Return of Semi-Floating Type—Gear Ratios Touch Bottom—Brake Problems—Contest Between Different Drives for Trucks

By A. Ludlow Clayden

THE rear axle arrived at a state of comparative perfection only quite recently, in fact it is probable that there is much more room for development still existing in the axle field than remains in the sphere of the clutch and gearset. The earliest "live" axles suffered from the ill effects of poor design and unsuitable material, they were apt to fail altogether by actual fracture of some part. As soon as the engineers and the steel makers had found means to overcome these troubles, there arose the noise question. This is almost finished with now, apparently, but to replace it there is the new demand for decreased weight. All the time the price obtainable has been falling steadily, so altogether the lot of an axle manufacturer is not the happiest imaginable.

Fundamental Types

Taking the expressed opinions of some of the leading axle makers on the question of the probable future popularity of semi-floating, full-floating and the intermediate types of axle shows that the protagonists of the three divisions are about equal in number. The following are interesting as answers to the question: Do you consider that there is a present trend toward semi-floating axles? If so, what do you regard as the explanation?

American Ball Bearing Co.:

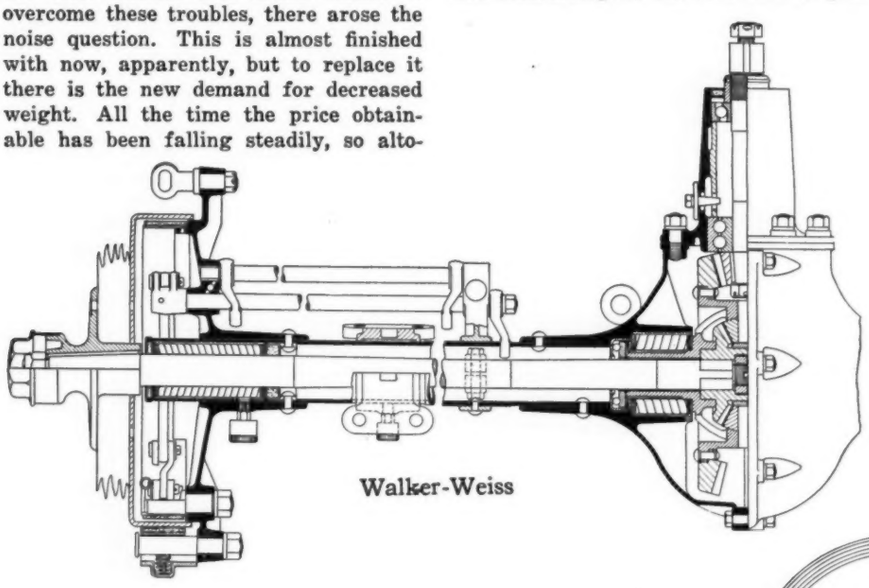
"Prefer full-floating."

Hess Spring & Axle Co.:

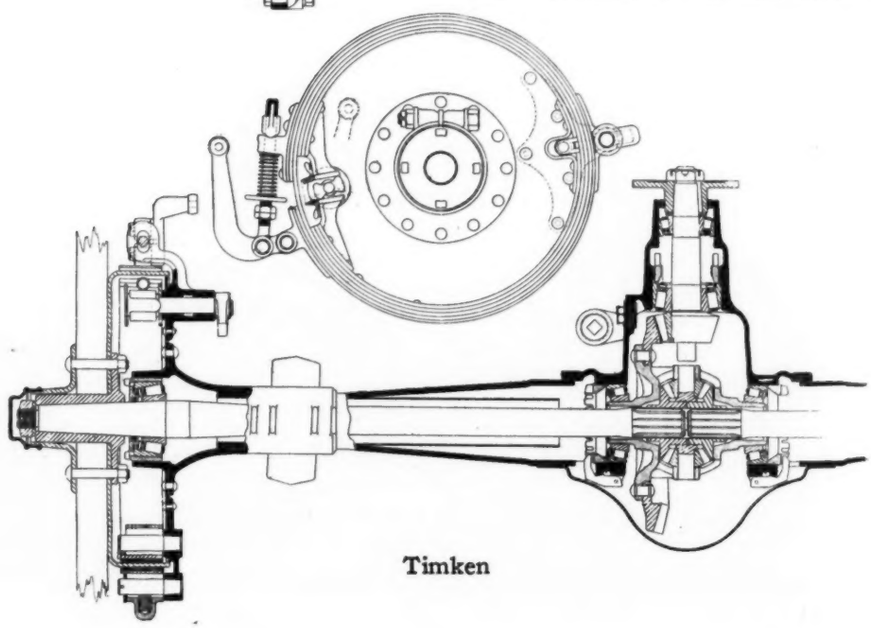
"We do consider that there is a present trend toward semi-floating axle. The only thing against the semi-floating axle is its name. The average buyer gets "cold feet," so to speak, when the agent tells him that the car is equipped with semi-floating axles. If the word semi was omitted, it would leave an entirely different impression. The buyer gets the idea that he is only getting half an axle. Our explanation for the trend toward semi-floating axles is principally because they can be made cheap. In the second place, theoretically they are easier on wheel bearings. The constant demand for cheaper and better equipment will undoubtedly bring the semi-floating into its own very shortly. If properly designed it is absolutely the best axle that can be made."

Peru Auto Parts Mfg. Co.:

"We do not feel there is a tendency toward returning to the semi-floating

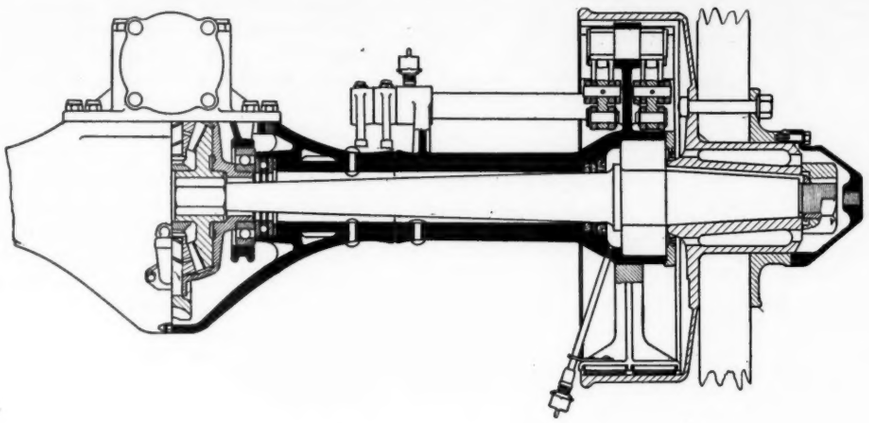


Walker-Weiss



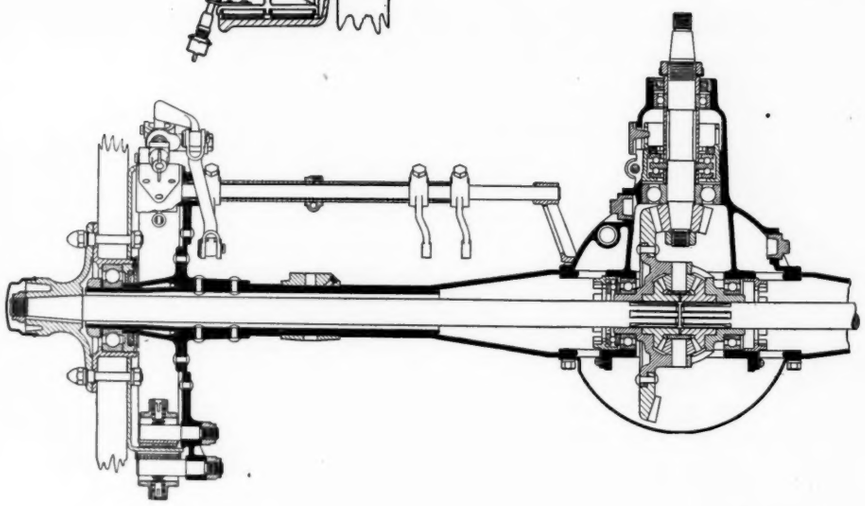
Timken

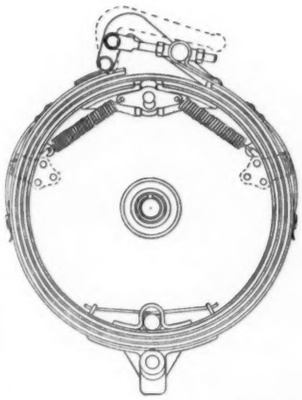
These two cuts of the Timken and Walker-Weiss semi-floating axles show two principles of construction. The former has a pressed steel case to which the whole differential assembly is bolted; the latter uses the differential assembly as the center case of the axle. In the Timken four taper roller bearings support all loads and thrusts on the driving shafts while two more carry the bevel pinion. In the Walker-Weiss the bearings that carry the load are very long, small diameter Hyatts and ball thrust washers are provided to resist end stresses. In the end view of the Timken brake, attention may be called to the light weight and the simple thumb nut adjustment for the outer band. On the cam which operates the expanding band sufficient lift is provided to enable the lining to be used up almost completely

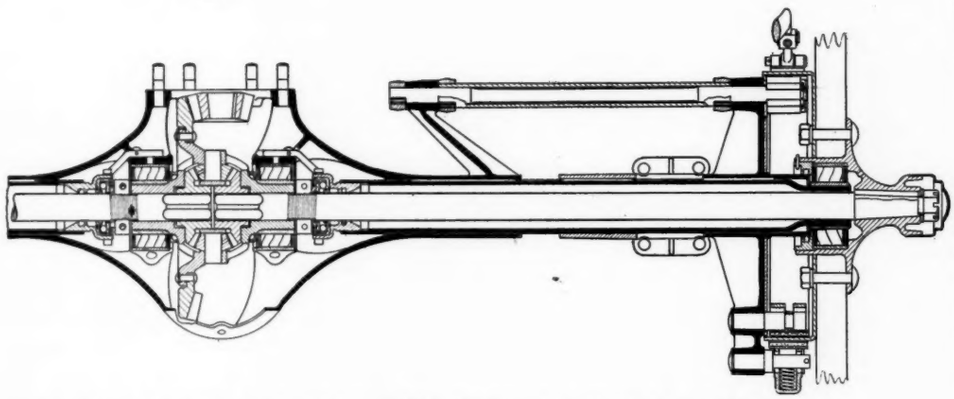


The Sheldon semi-floating truck axle is one of the heaviest constructions made on this principle, though it is claimed to be conspicuously lighter than the majority of worm drive truck axles of the full-floating type. It is equipped with ball bearings and has two internal brakes located side by side within the same drum

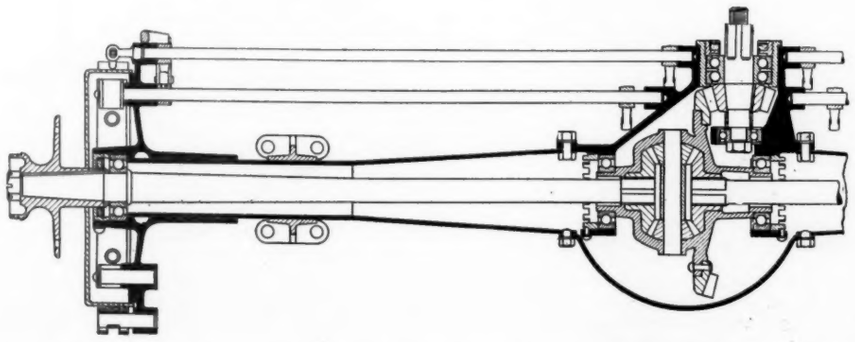
This Columbia axle is an example of three-quarter floating design, the single ball race on the end of the axle tube being in the plane of the wheel. Weight is carried by the tube, but the wheel is steadied by the drive shaft. A feature of this axle is the use of a very large double thrust race behind the bevel pinion, and it will be noticed that the differential assembly is made up independent of the axle casing. Bronze bushings are used for the brake operating shafts to prevent rusting and consequent sluggish action



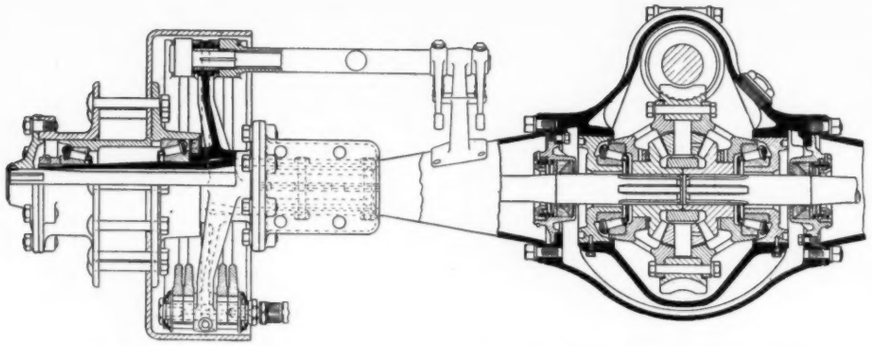




The Peru rear axle is a light type and well exemplifies the layout of Hyatt heavy duty bearings in axle construction, thrust being taken by ball bearings on either side of the differential. This axle is an example of built-up construction which the makers consider to be lighter and more satisfactory than the pressed steel type so far as small car work is concerned



The Hess axle typifies the pressed steel pattern as applied to light cars and the makers consider it to be simpler than the other type where the casing is a built-up job. On the question of weight they say there is little to choose, pointing out that a pressed axle needs no tie rod. In this axle the brake operating rods are longer than usual, but the method of mounting them does away with a bracket and so saves some weight



A worm-driven truck axle made by the American Ball Bearing Co., notable features are the double expanding brakes and the use of Bock taper roller bearings throughout. It should also be noticed that the worm and the worm wheel are mounted in the center case of the axle and the former is not removable from the wheel without taking down its mounting. This is a full-floating design all the weight being carried upon the tubes

construction. About 75 per cent of our rears are full-floating and balance three-quarters."

Salisbury Wheel & Mfg. Co.:

"No calls at all for semi-floating axles."

Sheldon Axle & Spring Co.:

"We do not manufacture anything but semi-floating axles and very few for the pleasure car trade, devoting our energies exclusively to the truck requirements. There is no more reason for a full-floating axle on a heavy automobile truck than on a locomotive. If locomotive engineers had to design a full-floating type, the bearing equipment would have to be so extremely large that there would be very little room left for spokes between the hub and the felloe.

"One has only to stand beside the railroad tracks and see a locomotive coming around a curve at 40 or 50 m.p.h., to see how very important it is to make as large a spread of bearing as possible. Very similar conditions are realized in motor truck operation. Sheldon was the first to use the semi-floating on anything above 2 tons. Their latest 5-ton axle has a factor of safety built into it very rarely realized in this form of drive.

"Where the wheels are pressed on to a tapered driving shaft, the demountable feature is also quite an item, particularly when the changes of tires are fairly frequent. If these changes have to be made in an ordinary garage with a pressed-on type of tire, the wheel has almost always to be taken off and with the full-floating type of axle the bearings are usually thrown on a dirty floor and put back with an improper adjustment, and in the case of the semi-floating, the wheel can be taken off without disturbing the bearing mounting or losing the oil in the least, and this is certainly a marked advantage over the full-floating type."

Timken-Detroit Axle Co.:

"Reduction in cost, accompanied with no reduction in serviceability."

Walker-Weiss Axle Co.:

"The general trend seems to be going toward the semi-floating type although in general we believe that the three-quarter floating type is somewhat better. The semi-floating type is liable to be a little better and cheaper to machine and makes a better manufacturing proposition."

Weston-Mott Co.:

"We do not believe a semi-floating axle is as good as the three-quarter or full-floating, one or two hub-bearing type, as in the semi-floating axle the shaft has to stand not only the torque but the weight of the car, while in the three-quarter and full-floating the shaft practically carries no load at all."

It is to be noticed that among these opinions at least one manufacturer expects the semi-floating type to come into general use for trucks. Of course there is no question but that either or any type will prove more than strong enough with modern design and modern steel.

Hotchkiss Drive Gains

It is not necessary to quote any figures to show how greatly the Hotchkiss drive is gaining in favor, the chassis descriptions published in the past year show this. Of course it is a great advantage to eliminate the weight of torque or radius rods and also remove their ever-present tendency to rattle; modern springs seem well able to care for the additional work imposed upon them by the driving stresses. Another advantage, from the owner's viewpoint, is the elimination of the spring table bearing which is obtained by securing the table to the axle in the way necessary for the Hotchkiss construction. The separate table needs lubrication where it rocks on the axle and is liable to squeak if neglected. Against this advantage we have the drawback of the necessity for two universals, but this is itself an advantage because the two joints give a better action than one alone. Altogether simplicity and all that it means to manufacturer and user is on the side of the Hotchkiss arrangement.

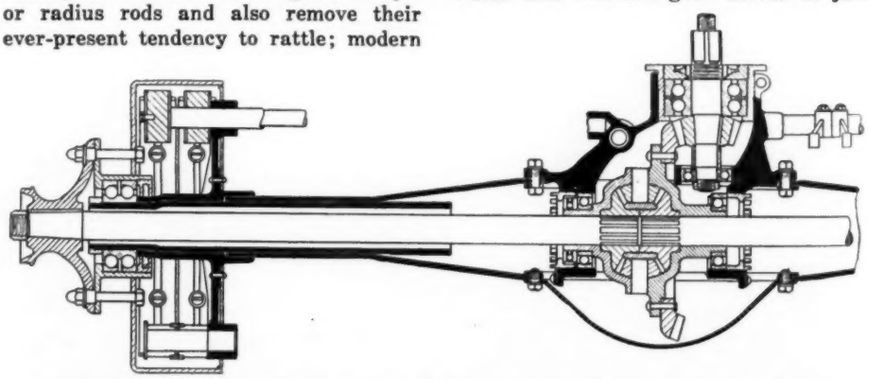
Gear Ratios Touch Bottom

When the spiral bevel came along it seemed that the noise trouble was overcome for ever by simpler means than the substitution of a worm gear for the straight bevel. The spiral bevel is a vastly better manufacturing proposition and gives a quietness so nearly equal to the worm that the difference is not worth considering. Then high gear ratios began to fall and with an approach to five to one the limit for the spiral bevel came in sight, since to go below this ratio calls for a large diameter and clumsy differential case. However, it is the opinion of axle manufacturers generally that gear ratios have touched bottom and that the cars of 1917 may be geared a little higher again than is the rule now.

This means that the spiral bevel is going to hold its sway and will probably completely displace the straight form just as soon as enough machines can be built for making the gear. At present there are thousands of straight tooth bevel cutters in existence for each spiral machine, and it will be some time yet before there are enough spiral cutters to take care of the needs of the automobile industry.

Worm V Internal Gear

In the truck field the situation between worm and internal gear drives is just



A type of Hess axle differing from that shown on the previous page. This is a three-quarter floating pattern but is otherwise similar in general respects. In this drawing the spigot bearing for the bevel pinion is shown very clearly. This feature of design is not very popular, but it certainly gives excellent support to the pinion and makes the outside of the axle very neat. It will be noticed that double internal brakes are employed

commencing to be interesting. Till quite lately the heavy field has been taken care of almost solely by the makers of worm gear axles, and the light trucks have been supplied mainly by the internal gear firms. There have been, and still are, only a few heavy pattern internal gear axles available, and there are correspondingly few worm axles suitable for *light* trucks. Thus the two types have developed side by side without much competition, each holding its own field and each giving great satisfaction.

Now the two are beginning to overlap a trifle and in the next two years the respective spheres of the two forms ought to be defined finally and conclusively.

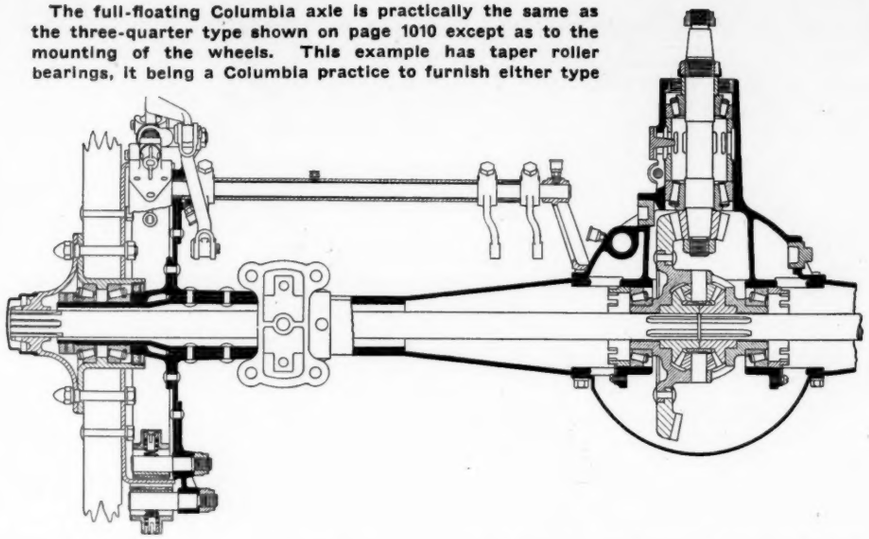
Without doubt, fashion has had something to do with the great rise to popularity of the worm gear for trucks of 3 ton capacity and over. Undoubtedly simplicity, ease of changing ratios and smaller susceptibility to abuse by neglect has encouraged the internal gear form. The pros and cons of each type are so intimately wrapped up with the service of the vehicle that it is going to take a couple of years more before any definite conclusions can be anticipated.

It may be—in fact it probably will be—that neither type of truck drive will become universal, but that both will continue to exist side by side, the advantages of the worm deciding its special field of application, and those of the internal gear fixing its sphere.

Ball or Roller Bearings

As to the relative advantages of ball bearings and of the various types of roller bearings, axle manufacturers are divided into as many sections as there are bearing patterns. The question is sometimes decided, apparently, by the limitations of space produced by other features, by cost, or by abundance of supply. In the axles illustrated on these pages almost every sort of bearing combination can be seen.

The full-floating Columbia axle is practically the same as the three-quarter type shown on page 1010 except as to the mounting of the wheels. This example has taper roller bearings, it being a Columbia practice to furnish either type



Some axle makers pin their faith to bearings of not only particular type but of particular make, this being where long experience has shown the reliability of the product in question. Others are prepared to supply either of several types and almost any make according to the desires of their customers.

The only possible conclusion is that each of the types of bearing used is capable of giving full satisfaction. Ball bearings of all sorts, taper roller bearings and roller bearings with parallel rollers depend upon the materials and upon the accuracy of their manufacture for durability and efficiency. A good one of either type is better than a poor one of any other, so with the quality of workmanship at the wonderfully high standard it has reached in America today the axle engineer is safe in following his personal predeliction.

Pressed-Steel and Built-Up Housings

In a similar way different axle makers prefer different methods of construction, some supporting the built-up axle while others prefer the pressed-steel. Where output is not very large the pressed-steel becomes the more expensive type without any question, but with large quantities it seems that there is little or nothing to choose on the score of cost.

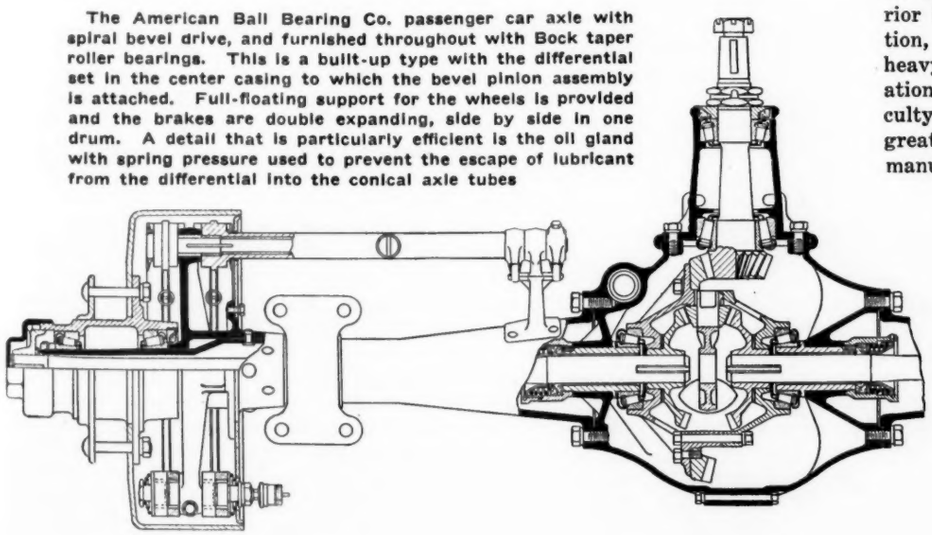
Naturally the manufacturers who have always used one type or the other prefer that with which they have had their experience, but when they make both their opinion as to which is the most advantageous is that it depends upon the exact circumstances of the case.

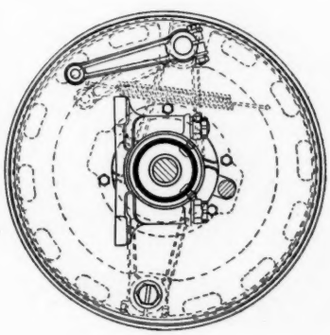
Brakes a Problem

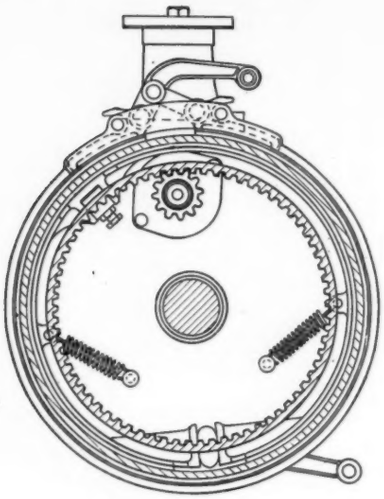
It is hardly possible to consider the question of brakes without going outside the specialized field of axle manufacture and observing the practice of the lesser number of automobile manufacturers using special designs. Of course the combination of internal band brake connected to the hand lever and external band to the pedal is still by far the most popular design, but there will be one or two more propeller-shaft brakes this year and a few more cases where double internal brakes on the axle are employed.

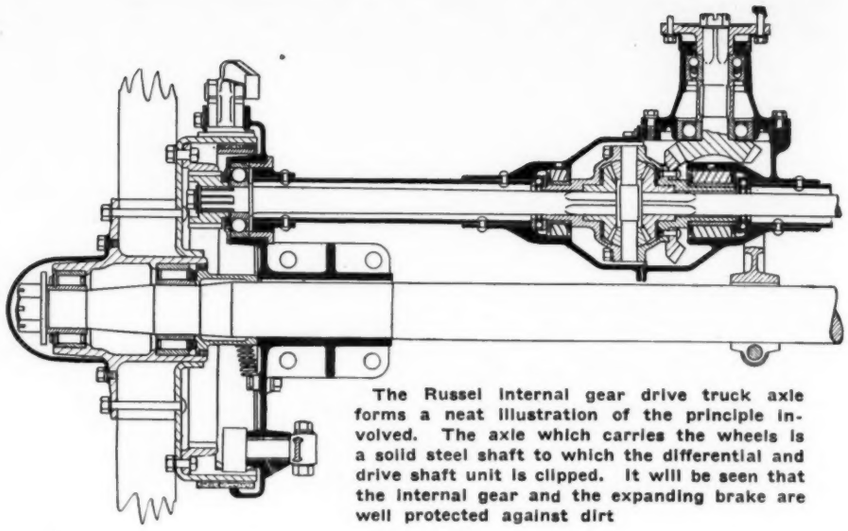
Brakes are a much neglected part of an automobile; they are infinitely inferior in design to almost any other portion, and their inefficiency is taking a heavy toll of life. The probable explanation is that there is considerable difficulty in making a brake which combines great power, smoothness and reasonable manufacturing cost. The band brake

The American Ball Bearing Co. passenger car axle with spiral bevel drive, and furnished throughout with Bock taper roller bearings. This is a built-up type with the differential set in the center casing to which the bevel pinion assembly is attached. Full-floating support for the wheels is provided and the brakes are double expanding, side by side in one drum. A detail that is particularly efficient is the oil gland with spring pressure used to prevent the escape of lubricant from the differential into the conical axle tubes









The Russel internal gear drive truck axle forms a neat illustration of the principle involved. The axle which carries the wheels is a solid steel shaft to which the differential and drive shaft unit is clipped. It will be seen that the internal gear and the expanding brake are well protected against dirt

has never, in any form, been entirely satisfactory unless made very large, and consequently heavy and clumsy, while however well it is made it needs constant adjustment to keep it in proper condition, and the number of links and joints provide opportunities for lost motion and an ever-present weakness under the increasing attacks of dirt and water.

It is notable that the layout of brake-operating rods on the chassis has improved greatly this year; there is far less spring in them and less joints, but the axle brakes remain practically unimproved.

From some points of view the double internal brake is ideal, as it is easy to inclose and can be very smooth and powerful if provided with heavy rigid shoes. But it must essentially cost more to make, and it is liable to be distinctly heavy, while the necessary width of the drums is often excessive and troublesome.

Laying Out Chain Camshaft Drives

The Principles Involved Discussed, and Some of the Problems

By F. L. Morse*

THE call for chain-driven timed shafts in the automobile probably first came because of its flexibility as to center distances, as evidenced by the International Harvester Co.'s application on overhead camshafts in 1908. Here the centers were long, and the chain was the easiest way to drive the camshaft, so upwards of a thousand were thus equipped. Next its use was suggested as a remedy for excessive noise, or what passes for the same fault—a regular variation in the noise so often found in gearing, as it is found nearly impossible to get a pair of gears exactly true mechanically and in tonal qualities.

The silent chain met these requirements of flexible centers and quiet operation, but brought a different trouble in its train, viz., short life due to the lengthening pitch. This was not a matter of chain destruction as understood by the chain maker, but rather of design or special application, as the accumulated lengthening of but 0.003 or 0.004 in. per pitch permitted the chain to become so loose as to strike some interfering point, and it was for this reason that removal was required.

This lengthening, however, of 0.003 or 0.004 in. per pitch is but a small percentage of the total life of a chain if adjustment had been provided, and, as a matter of fact, little trouble would be found from lack of correct timing until the chain had lengthened six times this amount, or 0.024 in. per link. However, thousands of drives had been put out with non-adjustable centers, notwithstanding every chain maker knew the desirability of and recommended adjustment. It was imperative that a chain be furnished that would lengthen less rapidly in order to give a reasonable life to the car user, so the chain makers immediately commenced to better their product.

The first and easiest expedient was to what is termed run the chain in, i.e., to take out the initial lengthening that would come from quick smoothing up and seating home of the joint parts in the punched holes in the links. Then followed as promptly as possible experiments to get more suitable steel and refinements in the process of manufacture. This was accomplished to a large extent within a year or two, so that then these early applications of chains to automobiles on a whole proved fairly satisfactory to all concerned, the average life being between 10,000 and 20,000 car miles. The chain then several years ago became a competitor for gears for the timed shaft drives on gas engines, and at an initial greater first cost, which indicated some added desirable feature, and a comparison between the two forms of transmission may indicate the future trend in design, which, I understand, is of particular interest to the automobile engineer.

In the general description of silent chains you have been told (1) that the chain contacts with and drives through all the teeth embraced by the chain, and (2) that it rises higher on the teeth as the chain lengthens, thus maintaining its correct pitch diameter, and (3) that it is only the free chain in between the sprockets which affects through its lengthening the angular relation of the two shafts. As a matter of fact, these statements are only partially true as far as the Morse chain is concerned, and, being interested in that product, I

*From a paper read before the Indianapolis Section of the S.A.E., November, 1915. Mr. Morse is president of the Morse Chain Co., Ithaca, N. Y.

will only speak of its action, as possibly a discussion may bring out the action of other products and wherein they differ, if at all, as I trust representatives of the chain makers are here.

The links of the silent chain contact with the sprockets at an angle greater than the angle of friction, and therefore tend to slide up the tooth, and the distance from engaging point to engaging point being obviously greater on the larger diameter, this action in effect compensates for an increasing pitch. Further, the engagement with the tooth is at a point below the line of pull, so there is also a lever action that tends to maintain the chain at a point higher than its true pitch, in addition to any centrifugal force that may exist.

Three Forces on Chain

We have, then, three forces that tend to slip the chain outwardly and over the teeth, requiring a definite opposing force to keep it on the teeth. Part and sometimes all of this restraining force is represented by frictional resistance to sliding up the teeth, it being a matter of the number of links in engagement on, as well as the size of the sprocket, varying with different sized wheels. Experiments have shown that five to thirty teeth in engagement are sufficient to keep the last link away from the direction of pull from raising on the tooth with any appreciable force. (The number of teeth in the wheels can be reduced so all except the first tooth engage with less than the angle of friction, but under these conditions the drive does not operate quietly or in accordance with the general design of silent chain.) If, then, more than this number of teeth engage the chain, it will float between the teeth, not touching either face, till the tension—there always being more or less—of the slack side pulls the chain against the idle or non-driving face of the teeth.

Drive Force Is Tension Difference

The effective driving force of the chain is the difference between the tight and slack strands, the same as in belting, and something of the same "creep" that is found in belting takes place on the tooth faces, as the chain is driving through frictional contact with many teeth. The drive gives a positive speed ratio because, either by friction against the teeth, or tension on the slack side, or both, it is prevented from going over the top of the teeth, while it still drives through frictional contact with, and has a slight movement on many teeth. The first tooth in engagement with the chain on the tension side is taking the largest share of the burden of driving, and the chain rides higher on this tooth than on the next tooth back, due to the angle of pull to the face of the tooth, and also because the chain is slightly elastic, and, due to the tension, is longer at this point.

At each successive tooth the lengthening due to elasticity decreases, due to the lesser tension, and also due to a lessening tension the chain gradually creeps down the tooth on the driving wheel until it gets to a point at or below its pitch diameter. Under these conditions the chain is drawing a spiral on the sprocket, the larger diameter on the driver at the entering tooth, on the driven at the leaving tooth, while the smaller diameter may be anywhere between these points and the leaving or entering tooth of the driver and driven respectively, depending on the number of teeth engaged by the chain. If these statements are correct, it follows that only a limited number of teeth on the chain wheel may do the driving, not all in contact with it, and as a corollary that it is always desirable to have this minimum number of teeth engaged by the chain. The distribution of the tension necessary to drive over a number of teeth is what makes the chain so quiet in action, as the taking up by the links of the pressure of driving is gradual and produces no blow effect.

The lengthening of the chain, and particularly that portion in tension between the chain wheels, causes a change in the angular relation of the connected shafts, and in camshafts a lag in timing is obvious. In addition to this, on account of the tooth face being at an angle to the line of pull, when the chain has lengthened and climbed higher on the tooth, this has permitted the wheels also to lag slightly more, but this is the worst that can be said, and can almost be neglected.

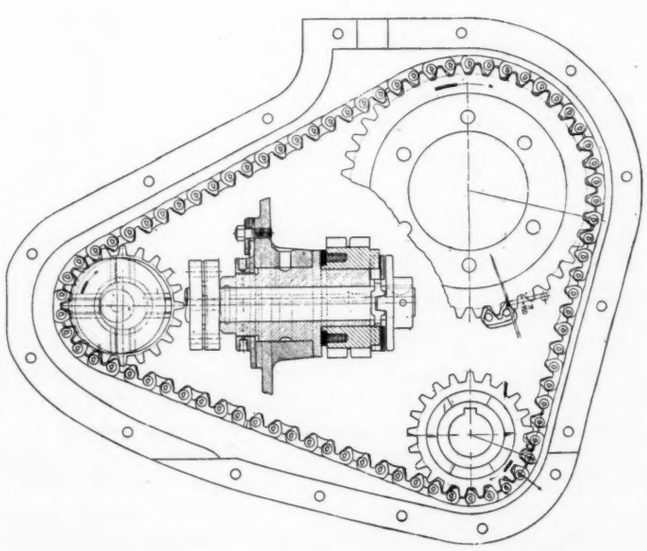
Details of Typical Layout

For instance, there is illustrated here a typical triangular drive, crankshaft sprocket, twenty-one teeth, camshaft sprocket forty-two teeth, on 6.406-in. centers. The chain has seventy-nine links, and the Morse adjustable sprocket is used on the accessory shaft. The adjustment will take care of a lengthening of one link, when the odd link furnished can be removed and the adjustment set back to zero, thus allowing for lengthening of another link, or ½ in., or a total of 1 in. This is an extreme case, and should be good for 50,000 to 100,000 car miles. We now have a lengthening of 1 in. in seventy-nine links, or 0.01265 in. per link, the crank sprocket being 3.355 in. and cam sprocket 6.691 in. pitch diameter. The wheels are on 6.406-in. centers, thirteen links in the tension run to the camshaft wheel, and thirteen times 0.01265 in. equals 0.16445 in. as a total, which in itself permits of a lag in the timing of approximately 2.8 deg. In lengthening this amount the chain has climbed radially 0.084 in. on the larger and 0.042 in. on the smaller wheel, and this has permitted the wheel to lag 0.072 in., equaling 1.2 deg., or a total for both causes of 4 deg. This is not very serious, as I understand it, and could in any case be compensated for by cutting, say, two keyways in the camshaft sprocket, the one in correct relation to a tooth when new, the second when one link is removed, so at no time could the lag in timing amount to more than 2 deg.

On the triangular drive above referred to, there was used a chain 1½ in. wide, ½-in. P., and this drove the camshaft, with water pump and generator on the third shaft. With this arrangement the total space parallel to the crankshaft was 1¾ in., or, allowing for back clearance, 2 in., which with gearing might have been reduced to 1½ in., so the saving in room by the use of gearing would have been about ½ in.

Unless a third or intermediate gear is used, there is generally more weight with the chain drive, but this amounts to not more than 4 lb. on an installation such as above, this being the total weight of the chain. The cost of chain wheels is less than that of gear wheels, as they can be cut faster, and there are practically no rejections. A case-hardening steel

(*Continued on page* 1037)



Details of chain layout and of Morse adjusting sprocket

The History of the American Automobile Industry—6

Copeland's Steam Bicycle Capable of 15 M.P.H.—Anticipating the Present-Day Side Car—$500 the Maximum Price for Motor Vehicles?—Public Confidence Grows

By David Beecroft

¶ Review—In the last installment the early development of steam road vehicles in their various forms was traced up to 1880, the prejudice of the public against them being mentioned. There were a number of three and four-wheeled steam carriages, as they were called at that time, and even a steam man for drawing a wagon, the figure being fitted with a light, high-speed engine. A growing demand for mechanical power became manifest in the seventies, there being several instances where advertisements appeared offering $5,000 and $10,000 reward for the invention of substitutes for street car horses and of practical road vehicles. By 1876 the gas engine had reached a stage of development where it was attracting serious attention for stationary power and boat work and about this time bicycles became of interest to the public.
¶ This week the narrative takes up the first motorcycle—a steam bicycle—and the prototype of the present-day side car and tells how $500 was thought to be the maximum price possible for a motor vehicle. It took nearly 10 years to get the public above this low-price limit, which was one reason that the motor vehicle did not come into common use much earlier. The wide publicity given the steam bicycle, however, did much to increase confidence in the self-propelled conveyance for everyday purposes.

OF experimenters whose influence has reached down to the modern automobile movement, dating from 1880 to the present day, although not a part of it, the first position seems to be due to Lucius D. Copeland, who, 35 years ago, was living at Phoenix, Ariz. Copeland began his work in 1881 by attempting to attach some form of motor to a Columbia bicycle that would not do all the work, but would assist where the going was hard. Possibly the sands of that southwest country were responsible for this desire for help. The high-wheel Columbia bicycle was hardly a structure to which a successful application of power could be made, and he reports his first attempt as both very inefficient and dangerous. About this time, the Star bicycle, which carried the large wheel at the rear in a frame and steered by the small front wheel, appeared on the market and one was purchased by Copeland. To this, he attached a small boiler on the inclined front frame tube and fitted a small engine just below the saddle with belt to a large pulley on the rear wheel. On a good road, this device would drive the bicycle at 15 miles per hour, a very creditable showing for so small an equipment. This was finished in the fall of 1884 in time for exhibition at the Maricopa County Fair at Phoenix. Later, being anxious to secure assistance, he showed the steam bicycle at Mechanics' Pavilion in San Francisco in 1884. The engine was ¼ hp. with the weight complete, including water, as 18 lb. Later reports describe the motor as 1 hp. and able to make 1000 r.p.m. and drive the vehicle 12 m.p.h. The entire equipment could be easily removed or transferred from one bicycle to another. When the date, 1884, is considered, it will be seen that this was a wonderful accomplishment and it is another illustration of the fact that the self-moving idea has always accompanied wheeled vehicle progress.

A Company Formed

The next spring Copeland showed this motorcycle in many California cities, such as Oakland, Berkeley, Sacramento, Stockton, Napa, Suisun, Watsonville, Santa Cruz, Vallejo, San Rafael, San Jose, and other places, besides several skating rinks and exhibition halls in San Francisco, but did not find the financial assistance wanted. He then proceeded to New York, where he exhibited at Madison Square Garden and other places. After 3 years of searching with a persistence worthy of a better reward, he met Sanford Northrop, who, with Drs. Starkey and Palen, of Philadelphia,

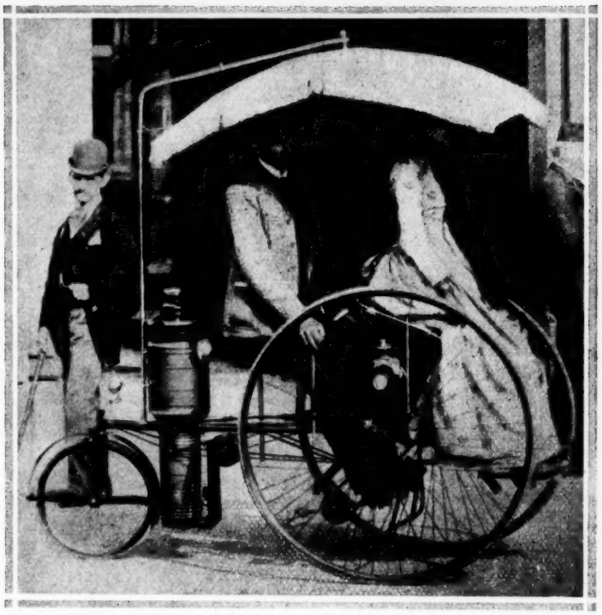
Lucius D. Copeland and his first successful steam motor, which is shown fitted to a Star bicycle of the vintage of 1884

formed a company known as the Northrop Mfg. Co., with a shop located in Camden, N. J. Here, having some capital, he was able to make improvements and 3 months later was running a steam tricycle on Camden streets. He fitted automatic water-level control and automatic fire control which depended upon the boiler pressure. He connected what would now be the brake and clutch levers by making the operation of the brake lever shut off the steam. He made many trips to adjoining towns, drove often in Fairmont Park, Philadelphia, and his longest trip was to Atlantic City, 60 miles, and return, carrying a son of Dr. Starkey as a passenger. His tricycle patent, applied for in October, 1886, was issued April 5, 1887, and covers the use of the framing tubing for an oil receptacle and the use of the exhaust steam to heat the feed water and fuel oil.

Prototype of the Side Car

In 1888 Copeland brought out a motor bicycle along the lines of the safety bicycle, which was beginning to make its appearance at that time and of which he, quite rightly, recognized the value. With his previous success, it is needless to say that this machine ran well. Afterward, he attached a wheel at one side on an adjustable reach so it could be fitted to any gage of road and on this reach was placed a seat for a third passenger, thus anticipating the modern side car by nearly a score of years.

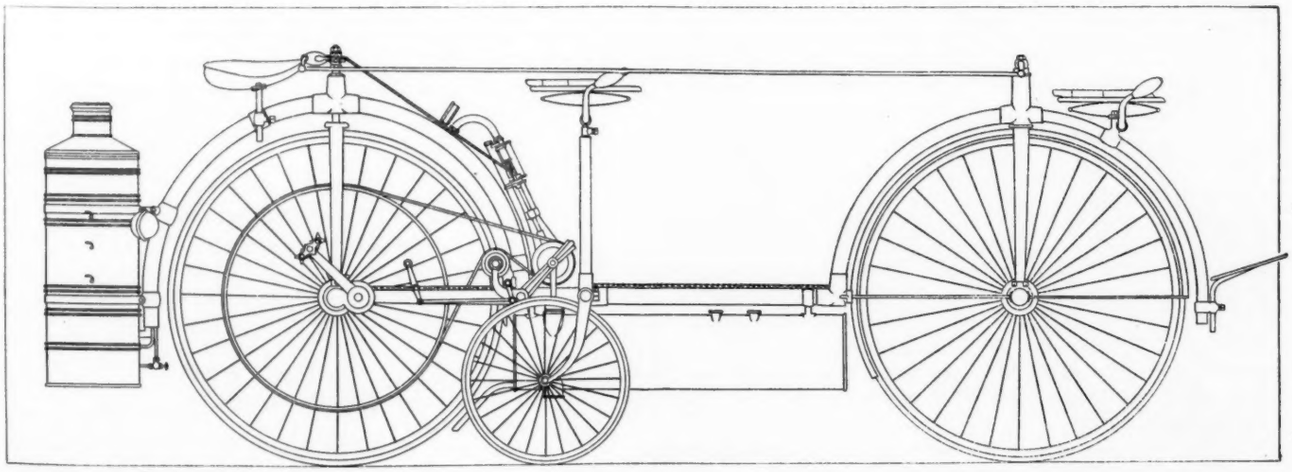
The Moto-Cycle Mfg. Co. of Philadelphia controlled Copeland's patents on steam bicycle motors, and in 1890 the vehicle produced used bicycle wheels with heavy rubber tires and a two-cylinder horizontal engine on the frame of the machine connected to the axle of the driving wheel by noiseless gearing. A safety boiler could get up steam in 5 min. and one filling of the water tank would suffice for 3 hr., or a 30-mile run. Fuel was carried on the other side of a partition in the same tank and some distance from the fire. One hand steered while the other held the throttle lever, and, releasing the throttle, stopped the engine. It is not known that any of these vehicles were sold and probably they were not.



Copeland's second machine, built in 1886, was a rear steering Invincible tandem tricycle to which he fitted his steam motor

$500 the Maximum Price?

Mr. Copeland, now of Sawtelle, Cal., says he became discouraged, thinking the people would not pay more than $500 for a motor vehicle and that there would be little or no profit in the business. This coincidence of opinion in the matter of maximum price, with that of Charles E. Duryea, who, in 1891, thought $500 the maximum, probably indicates very closely the feeling of the public. It took nearly 10 years to get our people above this low-price limit. The motor vehicle would have come much earlier had they been open minded enough to have accepted it. These exhibitions and the Copeland patent with the wide publicity given by the published descriptions undoubtedly did much to give the people confidence in the steam vehicle.



Copeland Moto-Cycle to carry three passengers. The rear rider steered and controlled the machine. Starting was accomplished by foot power by means of a lever and clutch arrangement driving the rear wheel. Adjustable idler wheels on both sides served to hold the machine upright when at rest

The Rostrum

Nickel-Steel Is Stronger Than Cold-Rolled

EDITOR THE AUTOMOBILE:—Strictly speaking, what is meant by a cast steel gear? A drop forged? Are there vanadium gears in use on many cars, and which of the three are the best and which costs the manufacturer the most to produce?

2—Is nickel-steel best to use for axle shafts, and must it heat-treated? If so, what effect has it on the shaft by treating it so? Which is the best to use, cold rolled, or vanadium steel, and which costs the most to produce?

3—Is cold-rolled steel simply a mild steel, or is it alloyed somewhat differently?

4—Which of the above materials does Overland use in its model 83 cars and what does Buick use in its 1913 to 1915 cars? Also the 1913 to 1915 Hupmobile?

Plentywood, Mont. J. S. K.

—A cast steel gear is one in which the gear is a steel casting. A drop-forged gear is one in which it is a forging. Vanadium steel gears are used on a few cars, but where alloy steel is used nickel is employed to a much larger extent. The alloy steels are the most costly. Forging is the method generally carried out in all cases, the forging being a blank and the teeth afterwards cut upon it.

2—In order to secure the benefit from nickel when used as an alloy, the steel must be heat-treated. Heat-treating the steel makes it tougher and stronger and increases the elastic limit. There is no comparison between cold-rolled and vanadium steels. Cold-rolled steel is that in which the metal has been rolled into shape while cold. It is only a simple carbon steel and is quite soft, as a rule.

3—Cold-rolled steel is not alloyed with any of the substances used to increase the physical properties of the metal. If you will refer to THE AUTOMOBILE for April 8, 1915, you will find a series of articles entitled "The Pathology of Steel," which will make clear to you the points upon which you desire enlightenment.

4—Regarding the materials used in the various cars you mention, it may be stated that all three of these concerns use a wide variety for different purposes. If you will mention the parts to which you particularly refer, the information could probably be given.

Excessive Carbon in Cylinders

Editor THE AUTOMOBILE:—To what would you attribute excessive accumulation of carbon in cylinders? The compression is splendid, the level of oil is correct, and the mixture is correct. The car is a 1911 model and has seen a great deal of service. Could the cylinders have become oval or could the rings have lined up so that the openings are all in line?

2—Would it be advisable to install aluminum pistons in the above car if I had the cylinders re-ground? In this case, would it be necessary to have new connecting-rods made? Do you recommend standard pistons and rings in preference to the aluminum ones in an old car?

3—Do you know of any way to repair broken celluloid windows in a top, without replacing the same?

These questions are relative to Packard 30 cars.

Orange, N. J. N. S. B.

—The excessive accumulation of carbon in the cylinders of the model 30 car is no doubt due to the natural wear of the cylinders and pistons which have now left enough clearance between same to allow the oil to work up. Although good compression is observed and the piston rings seem to be all right, this clearance will permit the oil to work its way through. The only thing to do in a case of this kind is to be sure that the oil level in the crankcase is kept at the proper level. If the cylinders still carbonize, they should be removed and a set of reground cylinders with properly fitted pistons should be installed.

The Packard Motor Car Co. keeps reground cylinders and pistons of all sizes on hand for this particular purpose, and you can get details regarding price from the nearest Packard agent.

2—It would not be advisable to install aluminum pistons in this model as the complete design of the motor is not intended for high-speed reciprocating parts and you would be apt to run into clearance difficulties. It would probably be more satisfactory in an old model of this sort to use the standard pistons and rings.

3—THE AUTOMOBILE has no record of any satisfactory method of repairing broken celluloid windows. It is easy enough to replace them by simply ripping out the stitching around the windows, put in a new piece of celluloid and stitching in the old seam.

Using Generator for Battery Charging

Editor THE AUTOMOBILE:—Would it be possible for a Wagner lighting and starting generator taken off a Studebaker 35 (the cutout relay being out of order, would have to be done away with), to be used for charging batteries, to be run by a stationary gasoline engine? If this could be done, please give instructions as to controlling charges and at what speed it should be run. Also any other information on the subject which would be of any help.

Sussex, N. B. H. W. S.

—This equipment can be used to charge six-cell lead batteries by closing the relay points permanently and arranging the engine drive so that it will run the generator from 1600 to 1800 r.p.m. The controller should be placed in the generator position and under these conditions the charging rate will be from 8 to 9 amp.

Troubled by Excessive Vibration

Editor THE AUTOMOBILE:—I have a 1910 Cadillac. It runs pretty well still, but has a good deal of vibration. Would aluminum or magnalium in pistons reduce this vibration sufficiently to warrant the expense? I am using a Schebler carbureter and getting but 5 miles per gallon. Can you suggest what can be the trouble? I formerly ran about 12 to 14 before installing the new carbureter.

Hibbing, Minn. B. S. A.

—In the opinion of the Cadillac company the effect of substituting aluminum or aluminum alloy for the standard material would not be such as to warrant the expense of same.

Regarding the mileage it would be well to make sure that

the carbureter is correctly adjusted. If in good repair and adjustment, the results obtained should be very satisfactory and the mileage much higher.

Average Output of Ford Magnetos

Editor THE AUTOMOBILE:—What is the average output of the 1914 and the 1915 Ford magnetos in amperes?

2—What is the frequency in cycles per second of each model at 1000 r.p.m.?

3—Am I right in the assumption that the frequency varies with the speed of the motor or is it independent of this?

4—What is the phase of this current?

5—What is the maximum speed at which perfect synchronism may be obtained from a Bosch magneto of the four-cylinder type? I mean by this, the speed of the magneto armature.

Marysville, Ohio. E. C. P.

—The voltage and the amperage of the model T Ford magneto varies according to the speed of the engine. With the ⅝-in. magneto used previous to October, 1914, the amperage ranges from 3 to 5. With the ¾-in. magneto used since that time, the amperage ranges from 5½ to 8.

2—As there are sixteen magnets and sixteen coil spools in the construction of the magneto assembly, it follows that there are sixteen electrical impulses with each revolution of the crankshaft.

3—This is answered under question 2.

4—This is also answered under question 2.

5—Tests made on the Bosch magneto show that it is possible to obtain synchronous ignition from a four-cylinder type at any and all speeds. Tests have been made on instruments where 15,000 sparks were obtained in a minute.

Description of Gearless Differential

Editor THE AUTOMOBILE:—Please give diagram and detail explanation of the gearless differential. Which cars use it?

Detroit, Mich. M. S.

—A diagram of the gearless differential in the form of a sectional view is given in Fig. 1. The actual assembly varies in different cases; that used on the Argo has the housing and the flanges in one piece while in that for the Ford they are in three pieces. The companies using this gearless differential as standard are the Argo Motor Co., Jackson, Mich., and the Woods Mobilette Co., Chicago, Ill., and also various light car concerns which obtain a complete axle from the Detroit Axle Co. The operation of the gearless differential is as follows:

The left hand differential flange, to which differential driving gear is bolted, the right hand flange, the center ring, and the right and left driving sectors, two at top and two at bottom, are all bolted together, making this whole outer differential housing a unit. The right and left ratchets, which are keyed to their respective axle shafts, are independent and free to rotate inside of housing. The two round members with knobs at ends and center, placed crosswise, are the walking beams, or pawls, and are the interlocking mediums between the driving sectors and ratchets. The illustration shows the right hand end of the top pawl in the tooth of the right hand ratchet and being driven by the contact face of the driving sector.

This drives the ratchet forward through the center of the end of the pawl. In the same manner the left ratchet is driven forward by the lower pawl, which is engaged at its left end. Thus both wheels are driven forward positively and neither can spin, as with the gear differential.

To drive backwards, the differential housing starts to move to the left and pushes the end of the pawl out of ratchet tooth, which throws the opposite end of the pawl down into the tooth of the opposite ratchet. Contact face of reverse driving sector engages and drives the wheel backward. The lower pawl acts in the same manner. In turning a corner, imagine that the car is being driven forward and is to be turned to the left. The right wheel starts to revolve faster than the left and causes the right hand ratchet to move faster than the differential housing, which can only go as fast as inner or slower moving wheel. The ratchet pushes the end of pawl out of its tooth, thus allowing the ratchet to have a free movement forward. As soon as the corner has been made and both wheels are revolving at equal speeds, the spring at the center of the pawl pushes the end of the pawl back into engagement and the drive is again taken up by both wheels.

When the wheels propel through the driveshaft, as in case of coasting or braking through it, both ratchets start to turn faster than housing, and push the engaged ends of pawls out of engagement and the opposite ends into driving position in the opposite ratchet teeth, thus causing the ratchets to propel the driveshaft.

Low and High-Tension Magnetos

Editor THE AUTOMOBILE:—What is the difference between a low- and a high-tension magneto?

2—Give a diagram, if possible, of the magneto and battery wiring on the 1907 Packard, using Eisemann magneto.

3—What is the transmission and rear axle gear ratio on the 1910 Briarcliff model Lozier?

4—Describe the oiling system on the 1910 Lozier. Does the oil passing through the sight feed feed to the cylinders or to the crankcase, and about how many drops of oil must the sight feed show?

5—Why does the fourth cylinder smoke on almost all 1910 Loziers?

6—How can a Remy magneto as used on a 1911 planetary Buick be jumped so as to show a spark when disconnected from the motor and regular wiring?

Bronx, N. Y. A. B.

—The difference betwen the low- and high-tension magnetos is that in the low-tension there is only a primary winding where low-tension current is generated, while in the high-tension magneto there is also included a secondary coil in which a high-tension current is induced, due to the interruption of the primary circuit.

2—A diagram of the magneto and battery wiring of the 1907 Packard Eisemann set is given in Fig. 3.

3—The gear ratio of this model is 2.8 to 1.

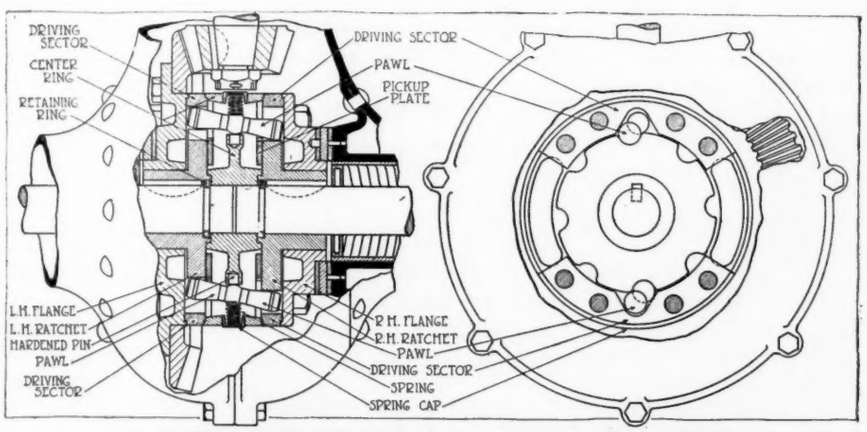


Fig. 1—Sectional and diagrammatic view of the gearless differential

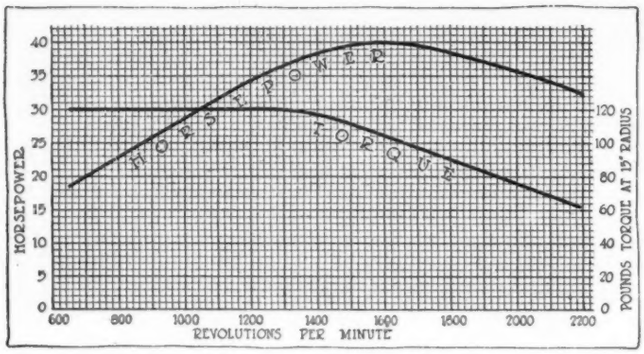


Fig. 2—Horsepower and torque curves of the Continental 4⅛ by 5¼ model C motor

4—The oil is drawn from the auxiliary tank on the side of the engine to the lubricator. It is then distributed by the lubricator to different parts of the motor and direct to the principal bearings. The oil pressure forces the oil back into the lubricator from the sight feed and then indicates that the lubricator is working.

5—So far as THE AUTOMOBILE has record, the statement that the four-cylinder smokes on almost all 1910 Loziers is not strictly correct, although it may be true of a few. If you will press back the tube on the connecting-rod cap to ½ in. so that it will not pick up so much oil, it will probably reduce the smoking materially.

6—If you are experimenting with this magneto, it is suggested that you place it in a lathe, using the lathe spindle to drive it, being sure that the magneto is well grounded on the lathe. Also be sure that the spark plugs are grounded to the lathe, that is, the outside of the plugs and not the core.

Wants Parts for Stoddard-Dayton

Editor THE AUTOMOBILE:—Can a set of this year's license plates be transferred from an old to a new car without notifying the license bureau?

2—Who makes the parts for the Stoddard-Dayton car?

3—What motor was used in the 1910, 1911, 1912 and 1913 Hudson?

New York City. J. KING.

—No.

2—Dayton Auto Repair Co., 351 West Fifty-first Street, New York City.

3—Two motors were used in the 1910 Hudson, the Buda and the Atlas. Since then all Hudson engines have been manufactured by the Continental Mfg. Co., Detroit.

Dimensions of Several 1916 Cars

Editor THE AUTOMOBILE:—What is the extreme width and length over all of the following 1916 cars with the top down: Reo four, Reo six, Dodge, Studebaker four and six and Jeffery four?

—The dimensions you request are as follows:

Car	Overall Length	Overall Width
Jeffery four	13 ft. 10 in.	5 ft. 7¾ in.
Studebaker four	13 ft. 8 in.	5 ft. 8 in.
Studebaker six	14 ft. 6 in.	5 ft. 8 in.
Reo four	14 ft. 2½ in.	5 ft. 7 in.
Reo six	15 ft. 6 in.	5 ft. 7 in.
Dodge	13 ft. 0 in.	5 ft. 6 in.

Remedying a Grabbing Clutch

Editor THE AUTOMOBILE:—I have a 1916 Buick model D 45 and find that the clutch grabs very badly. Can you tell me how I can remedy this?

2—I would like to know the price of a Wagner generator which comes on a 1914 Studebaker five-passenger, four-cylinder car. Also, where to look for trouble when it does not generate any electricity?

Troy, N. Y. J. M. S.

—The grabbing clutch is due to insufficient play in the clutch leather expanders which bring the leather out against the inner rim of the flywheel when the clutch is engaged. The difficulty can be easily overcome by removing washers from the ends of expander plunger stems.

2—The price of a new generator is $70. You do not furnish sufficient information to tell you exactly where to look for your trouble, but try the following means of remedying it:

a—Clean generator commutator carefully by using very fine sandpaper (00 grade). Do not use emery cloth.

b—Look for open circuit or loose connections at following points: Generator terminals, back of combination switch and junction box, battery indicator terminals, relay terminals, storage battery terminals.

c—Remove relay cover, start engine, and gently accelerate. If relay contact points close and open automatically as engine is speeded up and down, this indicates that generator is performing properly.

d—Stop engine. Test indicator for reversed connections by switching on headlamp. Indicator should read Discharge. Turn out lights, then start engine, run it at a speed corresponding to about 15 to 20 miles per hour and hold relay contact points closed with the finger. If indicator reads Discharge trouble is in generator. If indicator reads Charging trouble is in relay. If indicator reads Off, trouble is an open circuit.

Horsepower Curve of Continental C

Editor THE AUTOMOBILE:—Please show the power curve of a 4⅛ by 5¼ Studebaker 4-35 model. Also that of a Continental 4⅛ by 5¼ model C four-cylinder motor.

Brooklyn, N. Y. H. E.

—It is against the policy of the Studebaker company to permit the publication of horsepower curves of its motors. The power curve of the model C 4⅛ by 5¼ Continental motor is given in Fig. 2.

Salt Removes Carbon But Rusts Motor

Editor THE AUTOMOBILE:—I have a friend here who drives a Buick and cleans carbon out with salt. He runs his engine 2 or 3 min. to warm up, then removes the spark plugs and puts 1½ normal salt tablets in each cylinder and then runs the car about 15 miles, by which time there is no carbon remaining in engine or valves. I know that this will remove all carbon deposits, but will the chemical action set up by the salt and heat do any damage to the cylinders?

Live Oak, Fla. A. E. W.

—While salt will burn off the carbon by chemical action due to the combination of the salt and carbon into sodium carbonate it is possible that the combination of chlorine with the hydrogen in gasoline would form hydrochloric acid, which would tend to have an intense rusting action on the cylinders.

Lighter Pistons Reduce Vibration

Editor THE AUTOMOBILE:—I have a 1914 Cadillac car and would like to have your opinion as to my making a change on the pistons and connecting-rods. The engine has good power and I think good economy. However, it vibrates a good deal and is not very quiet.

I was thinking that by taking some of the weight off of the pistons and rods that the engine would not vibrate so much and would be more quiet. Also it might increase the power but at the speed I usually run, which is 20 to 25 m.p.h., it might not be noticed. However, if you think it would be a benefit, please tell me what the best method would be in making this change.

Unless the change would be quite an improvement, I hardly think it would warrant my spending very much for it.

Youngstown, Ohio. S. W. G.

—It is probably true that a reduction in the weight of the piston rods in this motor would reduce the vibration somewhat. However, as these pistons and connecting-rods were designed to carry safely only certain loads such as are likely to be imposed upon them, it would be dangerous to weaken them. Practically speaking, it is very much to be doubted if these parts could be made sufficiently lighter than they were originally to reduce the vibration sufficiently to make any perceptible difference.

Cone and Disk Have Even Break

Editor THE AUTOMOBILE:—Please give a discussion of the comparative efficiency of the types of clutches used on modern automobiles—the cone clutch and multiple disk, running in oil and with dry plates. If there is a choice of type of clutch for a particular car, please state which type is the best for which cars. In your opinion, is there an all around best type of clutch?

Brooklyn, N. Y. F. P. BLISS.

—Regarding a general discussion of disk and cone clutches it is very difficult to expound on the advantages and disadvantages of each since they are about equally matched in popularity if the choice of automobile designers in this country can be taken as a criterion. The disk and cone clutches have been hovering on the side of the 50 per cent mark each for the last five years as regards the specifications of American cars. Either type is excellent and will give ample satisfaction.

High Gear Ratio for Buick

Editor THE AUTOMOBILE:—Would there be any advantage in setting the timing gear on the magneto shaft one tooth or two teeth ahead? Would it take up the wear or play caused by two years of running?

What is the gear ratio of the differential in a White Streak Buick? How much higher would you have to gear it to get 10 miles more speed?

Mt. View, Cal. J. C. M.

—The advancing of the magneto gear one or two teeth would not take up back lash caused by wear, but will compensate for lag in the electrical system at high speeds.

The Buick Motor Co. never designated any of its models by the title of White Streak. It is believed, however, that this appellation was applied to some model 10 cars, which were used for racing. These were built with both 3½ to 1 and 3 to 1 rear axles and if you have one in which the gears are marked 48 and 13 you can get more speed by inserting a set of 48 and 15 gears.

Steering Column Is Easily Lowered

Editor THE AUTOMOBILE:—Is there a firm in Missouri manufacturing an automobile signal device for the front and rear of the machine? If so, what is its name and address?

2—Has the Sharon tandem car been used successfully as yet? About how many are in use?

3—Can the steering column of a Studebaker 20 be lowered to any angle without much expense? What must be done to lower it?

4—Does the company which manufactured the Cutting car still exist?

5—Is the silent Knight motor much in demand at the present?

6—What is the horsepower of a Ford?

Seelyville, Ind. L. F.

—It is very possible that the concern which you have in mind is that of A. P. Rothermich, 2915 N. Taylor Avenue, St. Louis, Mo.

2—THE AUTOMOBILE has no record of the performance of these cars.

3—The steering gear on the Studebaker 20 is pivoted to the cross member of the frame, and it can be raised or lowered to certain angles by the installation of a steering post tube and bracket assembly, which can be had by placing your order with the nearest Studebaker dealer. Inasmuch as you do not state the exact angle which you desire, it is impossible to give prices, etc., but the change can be readily made at little expense.

4—No. Parts can be secured from the Puritan Machine Co., Detroit, Mich., or S. C. Erbes, St. Paul, Minn.

5—The Knight motor is being produced in greater quantities this year than ever before.

6—About 20 hp.

Valve Stem Clearance Causes Knock

Editor THE AUTOMOBILE:—Can you tell me what in your opinion would cause a light tap in a Ford motor? This tap is very noticeable at all engine speeds, both when running under load and when idling. It sounds like a too far advanced spark, but this is not the cause. Neither is it caused by the piston striking the cylinder head gasket. The tap is regular and occurs in one cylinder. It is not caused by carbon or connecting-rod trouble.

Washburn, Me. E. M. G.

—From the data you give, it would seem that you are referring to a valve tap which possibly results from worn push rods or valve stems in which case the parts should be replaced and fitted with the proper gap of not more than 1/32 in. and not less than 1/64 in. between the parts. When the gap is too wide between the push rods and valve stems, noise will result.

Knocks which become audible with advanced spark usually originate somewhere in the piston assembly and are probably due to loose pistons, worn piston pin bushings, or to the condition of the bearing at the connecting-rod end. Sometimes it happens that the connecting-rod itself is out of alignment or bent.

Dust Cover Perhaps Too Tight

Editor THE AUTOMOBILE:—Can you help me on this? The high and intermediate gear-shifting fork on my Buick 37 wears out very quickly. I have had to put in three in going 11,000 miles. The machine has been well oiled all of the time. The gears do not cause me any trouble when shifting.

Orono, Me. H. H.

—The cause of the shifter forks wearing on this car is that the control lever binds in its socket. This is caused either by lack of lubrication or else by having the control lever dust cap which fits over the ball socket drawn up too tightly against the side. Make sure the gears mesh fully and do not only half engage.

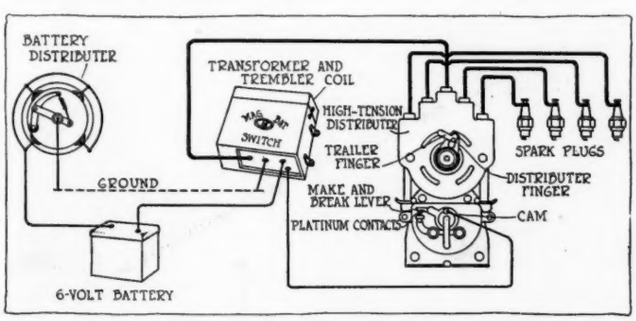
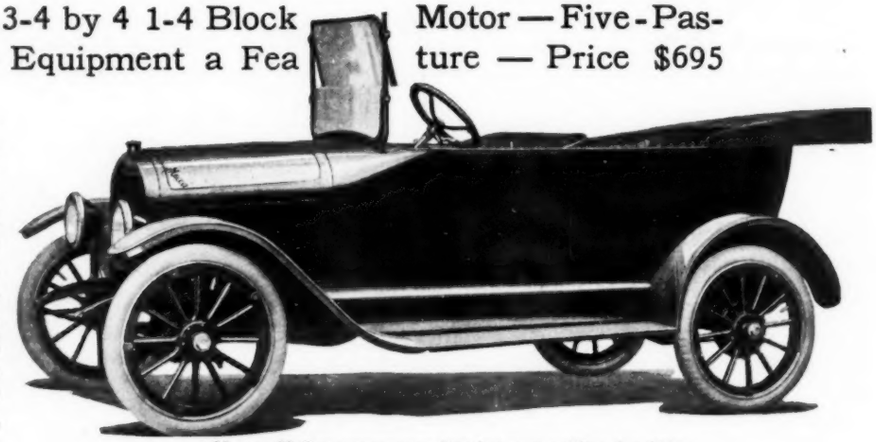


Fig. 3—Wiring diagram of the Eisemann ignition system on the 1907 Packard

Gearless Differential in Mecca 30

Four-Cylinder 3 3-4 by 4 1-4 Block Motor — Five-Passenger Body — Equipment a Feature — Price $695



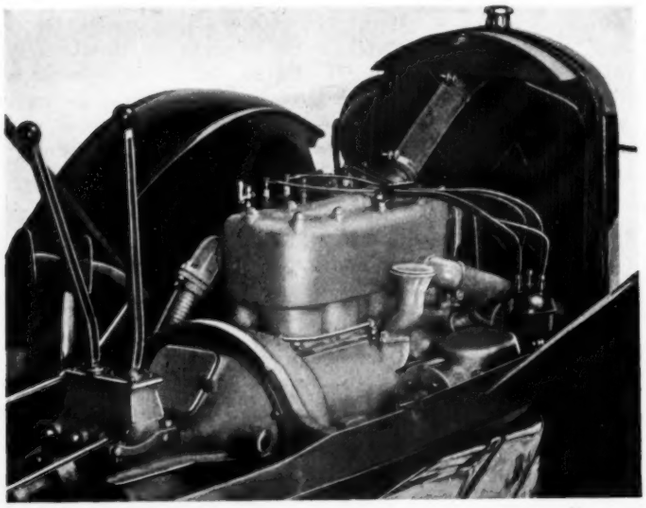
Mecca 30 five-passenger touring car selling for $695

AN assembled car has been put on the market by the Times Square Automobile Co. of New York and Chicago, a concern which has now, in addition to its line of rebuilt and used cars, brought out a product to meet the demands of those desiring a new car at moderate price. The car is made in Detroit and sells for $695 f.o.b. that city.

Standard specifications will be found throughout as the car is assembled from parts made by well-known concerns. The power plant is a four-cylinder Golden, Belknap & Swartz product, having a bore of 3¾ in. with a stroke of 4¼ in. This gives a piston displacement of 187.9 cu. in. This is an L-head design with the cylinders cast in a single block and with a removable top to the cylinders. The motor is of standard construction throughout, the cylinders and pistons being gray iron with light-weight aluminum crankcase and gearset housing bolted together in unit power plant style. The bearings are nickel babbitt and are three in number for the crankshaft. Pounding of the motor at low speeds is guarded against by allowing liberal bearing sizes and a heavy flywheel which keeps the variation in angular velocity at a minimum. The makers claim that with this motor the car is free from vibration up to 40 m.p.h.

Valves Are Large

Cast-iron valves with steel stems are employed. The drive for the valves is through a chain-driven camshaft, thence through the integral cams to positive lifters. The valves have a clear opening of 1⅝ in. in diameter. The outside diameter of the valves is 1 13/16 in. and the lift 7/32 in. The valves are adjustable in the customary manner and are inclosed. The silence features as regards the valve action have been given ample attention as beyond inclosing the valves in removable cover plates the driving chains run in oil and have provision for adjustment to take up any slack.



Unit power plant used in the Mecca 30, showing mounting of the control levers on the top of the gearbox

Ample Factors of Safety

In the selection of materials an ample factor of safety will be found to have been left in all parts under shocking stresses. The connecting-rods are 0.30 to 0.36 carbon steel, drop-forged and heat treated. They are of I-beam section and have ample bearing area both at the oscillating piston pin joint and at the large end bearing on the crankshaft. The bearings in the connecting-rods, as well as those for the crankshaft, are ground to size and the material used in the crankshaft is 0.35 to 0.40 carbon steel. This is, of course, a drop-forging and is heat-treated to produce the rigidity necessary in this class of work.

In the oiling system, which is a pressure feed to the main bearings, the plunger pump is operated directly from the exhaust cam for the number four, or rear cylinder. This pump delivers oil under pressure to a sight feed on the dash whence it passes directly to the motor bearings. In addition to the feed to the bearings the internal parts of the motor are lubricated by the oil mist created by the revolving cranks. This oil vapor pervades the entire crankcase and supplies an ample amount of lubricant to take care of the needs of the pistons and cylinders.

Stewart Vacuum Fuel Feed

A Stewart vacuum system is used for gasoline feed. The carbureter is a Schebler. With this system the gasoline tank, which is of 10-gal. capacity, is hung from the rear of the frame and the auxiliary tank is mounted on the dash. The design of the system is standard and is the same as that employed on a large percentage of American cars this season.

Ignition is by the Splitdorf Dixie model high-tension magneto and the balance of the electric equipment is made up of the Disco units for electric lighting and starting. This is a single unit system connected to the crankshaft by silent chain. The motor generator starts charging the battery at a car speed of about 9 m.p.h. and operates in connection with a Detroit storage battery.

Clutch Runs in Oil

Power is taken from the motor by a single steel drive plate clutch which operates between two wire-woven asbestos friction disks running in oil. The gearset is a selective de-

sign providing three forward speeds. The control is central with the gearshifter lever mounted directly on the cover plate of the gearbox. This clutch and gearbox unit gives a very compact design and one of the features claimed for the clutch is that when once properly set it will never need to be readjusted. According to the maker, with all the parts running in oil to reduce wear and due to the positive action through the series of clamping levers given by the spring pressure, the clutch is never so worn as to need a readjustment. At the time of disengaging the engaging or clamping levers a master ring revolves, positively releasing the disks.

Gearless Differential Used

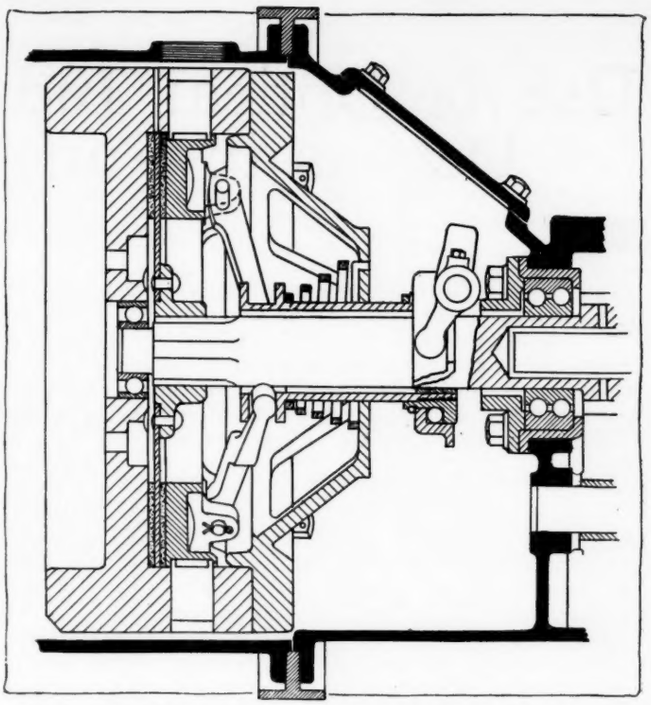
Final drive is through two universals to a semi-floating rear axle. The axle is provided with a gearless differential which is mounted accessibly under a large cover plate. The bearing equipment and the rear axle consist of Hyatt rollers of high-duty type. The frame construction is of pressed channel steel and the springs are semi-elliptic front and three-quarter elliptic rear. The main leaves are of vanadium steel and are guaranteed against breakage for two years. Both sets of brakes are on the rear wheels, the drums are 12 in. in diameter, the wheels are hickory and are equipped with demountable rims taking 30 by 3½ tires. Non-skid tires are furnished in the rear as standard equipment.

3 to 50 Miles per Hour

The chassis length is 104 in. from axle center to axle center and the tread is standard 56 in. providing a road clearance of 10 in. The speed range of the vehicle is from 3 to 50 m.p.h. Steering is by adjustable worm and gear and either left or right drive may be secured as desired.

Five-Passenger Body

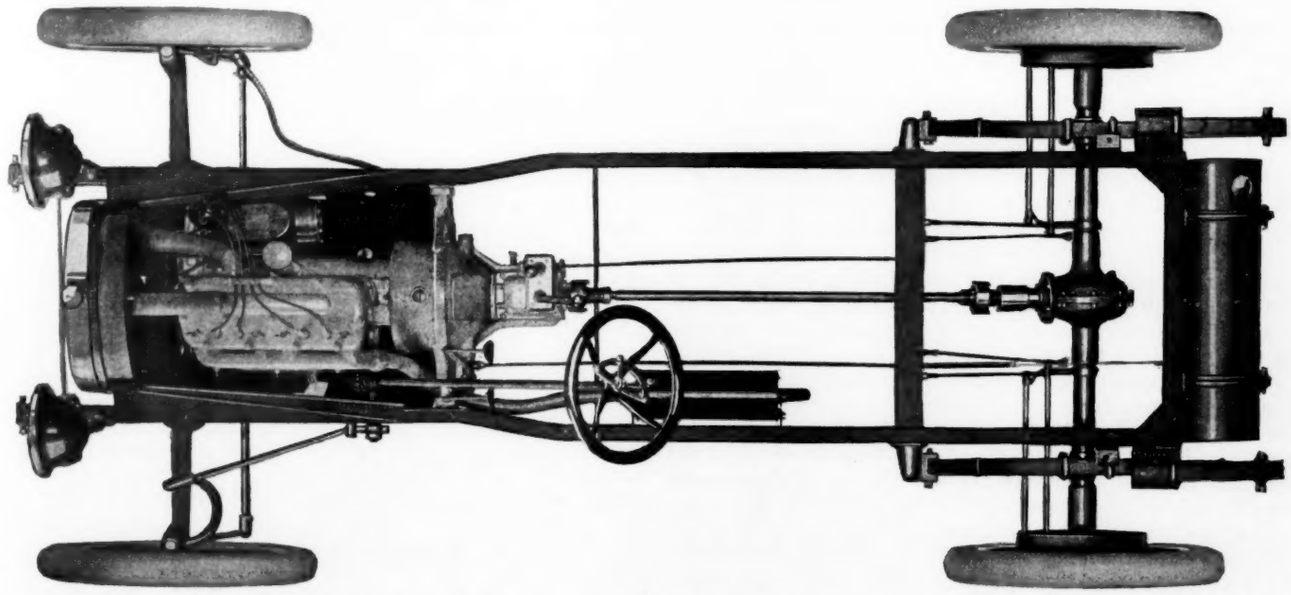
The standard body is a five-passenger touring with streamline design. In addition there is a roadster or raceabout of two-passenger capacity. The cars are finished in what the makers call Mecca blue which is a blue somewhat on the shade of what is commonly known as royal. The car is sold with full equipment including the electric starting and lighting system, two electric headlights equipped with dimmers, electric tail lights, silk mohair one-man top, two-piece rain-vision windshield, number bracket, robe rail, quick-adjustable side curtains, tools, tire holders, extra rim, pump and warning signal.



Section through the clutch used on the Mecca 30 which forms a compact unit with the gearbox. One of the features claimed for this clutch design is that when it is once properly set it will never be necessary to readjust it. All parts run in oil and the action of the spring pressure is positive through the series of clamping levers. At the time of disengaging the clamping levers a master ring revolves, positively releasing the disks.

State Purpose of Sample Invoice

The United Export Bureau of THE AUTOMOBILE has received a report from Jerez de la Frontera, Spain, recommending that where samples are forwarded to prospective customers on memo charge sheets and no actual charge is intended that this should be clearly stated. The report says that recently a merchant in that place was highly indignant on receiving such a memo sheet as he thought he was being charged for the sample. Many such misunderstandings would be avoided by stating the purpose of the invoice.



Plan of Mecca 30 chassis, showing simple but strong construction. This car is assembled from well known units

Use of Optical Indicators for Checking Defects in Functioning of Motors

(*Continued from page 979, last week*)

CONSTRUCTION, adjustment and operation of optical indicators—as practised in Germany—were covered briefly in the first part of this article, which appeared last week. It also gave diagrams illustrating faults related to the admission of gas and to the compression. The closing words referred to Fig. 21 in this issue and faults in the timing of the spark—the subject continued herewith.

Diagrams Showing Faults of Ignition

With only 16 per cent advance, the diagram, *c*, is considerably better, and with 13 per cent advance the best diagram, *f*, is obtained. The correct advance depends of course in each case upon the motor speed and the means used for ignition. A spark that is 5 per cent late gives diagram *e*, and one 10 per cent late diagram *f*. In all these diagrams under Fig. 21 only the changes due to variation in the timing of the spark are shown as they appear. The diagrams in their entirety look somewhat different. The original for diagram *e*, Fig. 21, for example, looks more like Fig. 22. Comparison of the diagram areas under Fig. 21 discloses a serious loss of power efficiency with faulty spark timing. Diagram *e* corresponds to 20 horsepowers and *a* only to 16; *f* to 15. The fuel consumption increases correspondingly with the error in spark adjustment, for any given amount of work to be done.

Misfires are shown in a diagram by an expansion curve almost coinciding with the compression curve, making the diagram look similar to Fig. 17, excepting that the expansion curve lies somewhat above the compression curve because the compression is good and the cylinder wall has imparted some heat to the gas during the compression.

In Figs. 23 and 24, it is plainly shown what influence the position of the spark plug has upon the amount of work done by the motor. With the spark plug over the exhaust valve, one obtains diagrams *a*, *b* and *c* of Fig. 23 at different motor speeds. Diagram *a* represents 640 r.p.m. and shows a maximum pressure of 21.8 atmospheres, while the shape of the diagram remains fairly normal. Raising the speed to 1100 revolutions produces the jagged curve of diagram *b*, and the maximum pressure varies from 14 to 18 atmospheres. If the speed is further increased to 1600 revolutions, the jagged effects in the upper half of the diagram become still more marked and the efficiency lower.

When, on the other hand, the spark plug is placed over the inlet valve, the diagrams of Fig. 24 are obtained. These diagrams, *a*, *b* and *c*, are taken at the same motor speeds as those of Fig. 23, and at the higher speeds there is a notable improvement in the shapes (more easily seen in the original diagrams than in the reduced reproductions) which is explained by the presence of fresh gas mixture in the vicinity of the spark plug terminals.

When two spark plugs are used for one cylinder and they are placed respectively over the exhaust and the inlet valves, the diagrams under Fig. 25 are obtained with the same motor speeds as before. It is seen that in this case the shape of the diagram remains essentially the same at the higher speeds as at the lower, this being due to the more rapid inflammation of the gas mixture when ignited at two places. A simple comparison of the diagram areas—as between *b* and *c* in Figs. 23 and 24 and *b* and *c* of Fig. 25—shows also a considerable increase of the motor power in favor of the double ignition. The incipient jaggedness of the expansion curve of diagram *c*, Fig. 25, shows however that a continued speed as high as 1600 revolutions would not be recommendable for the motor used, the jaggedness indicating a drop in efficiency. These diagrams, as well as some of the following ones, were taken by Professor Watson with a Dalby-Watson indicator.

If a car has both magneto and battery ignition it is easy to compare the merits of the two methods by means of an indicator. Diagrams *a* and *b* in Fig. 26, taken by switching-in respectively the magneto and the coil, in both cases with the gas mixture quite rich, show no important difference in the results obtained from the two methods. But if a poor mixture is used, both maximum and mean pressures during the working strokes are found much more regular with magneto ignition than with coil ignition, the

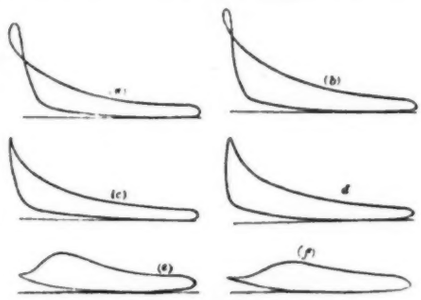


Fig. 21—Faults in spark timing

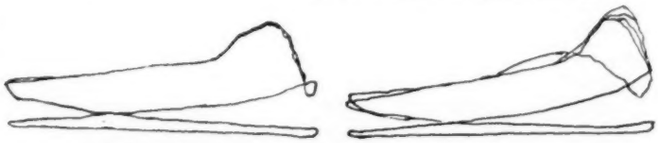


Fig. 22 (left)—Actual diagram of late firing
Fig. 27 (right)—Very poor mixture and late exhaust

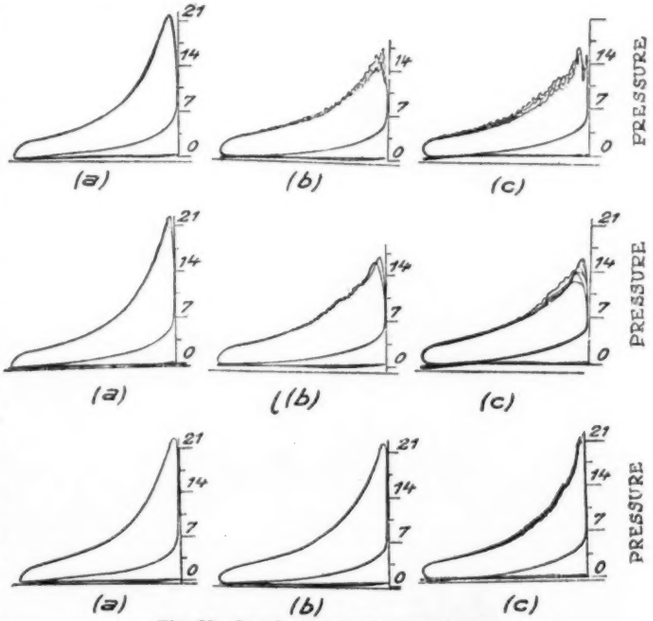


Fig. 23—Spark plug over exhaust valve
Fig. 24—Spark plug over inlet valve
Fig. 25—Spark plugs over both valves
(a) 640 r.p.m. (b) 1100 r.p.m. (c) 1600 r.p.m.

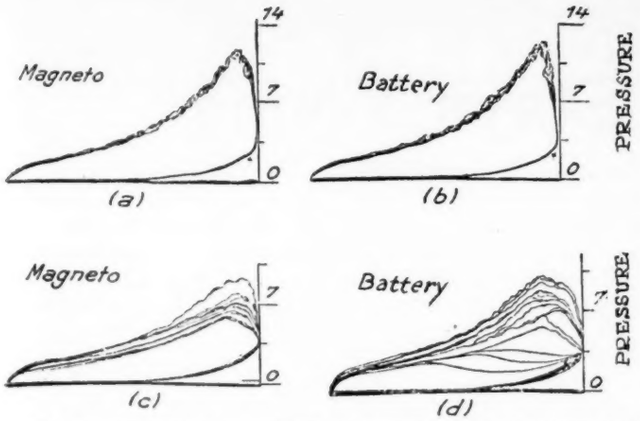


Fig. 26—Comparison of ignition by magneto and by battery and coil—(*a*) and (*b*) with suitable gas mixture; (*c*) and (*d*) with lean mixture

diagrams *c* and *d*, Fig. 26, showing the difference. In some of the cycles, it is noticed, the ignition from the coil progresses so slowly, as in diagram *d*, that the pressure does not reach its highest value till at the end of the work stroke. The small crosses at the compression curves in the diagram of Fig. 26 indicate in each case the point at which the spark was released.

Influence of the Carburetion

That the carburetion, as well as the ignition, has great influence on the power of the explosion and the efficiency of the motor is also demonstrated in detail by means of indicator diagrams. Fig. 27, for example, represents the original diagram of a motor running on a very lean gas mixture. The gas burns with difficulty and has small heating capacity, and the diagram area is therefore greatly reduced. When, on the other hand, the gas throttle is opened completely and the same motor gets a mixture with sufficient gas the diagram of Fig. 28 is obtained. In this diagram it is noticed that the gasoline does not vaporize well or that the carbureter is too cold. Globules of gasoline cause a series of successive small explosions, marked *E* in the diagram, by which the whole volume of the charge becomes subject to vibration. The diagram is a composite of a large number of superimposed photographic diagrams, and the curves are therefore thickened. The first part of the exhaust curve has a strong course, showing that the exhaust valve affords a sufficient opening for driving the gas quickly from *A* toward *B*. By reason of the rapid flow of the gas in the exhaust manifold there arises a slight depression *CD* in the cylinder, lasting through the first part of the suction stroke but disappearing toward the lower dead center *B*.

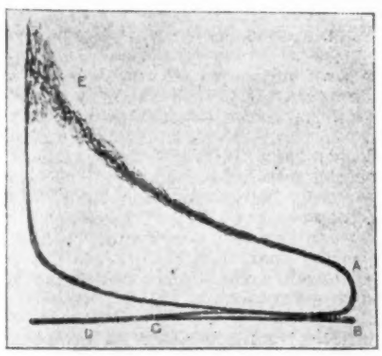


Fig. 28—Composite diagram with gasoline heavy or carbureter cold—Compare Fig. 27

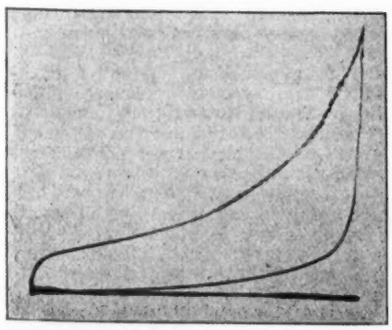


Fig. 29—Slow throttled running with rich mixture

If the same motor is run very slowly but with a rich gas mixture, the diagram of Fig. 29 is obtained, in which the expansion curve is more definite. This effect is due to the necessity of throttling the intake, which favors the vaporization of the gasoline globules, so that the charge is more readily fired. The exhaust begins in this case at the same point as before, but, as the motor runs slowly, atmospheric pressure is reached at dead center *D*. The area is smaller than that of the previous diagram, showing the reduced power of each explosion.

Diagrams of Exhaust and Muffler Action

When the diameter or lift of the exhaust valve is too small or the exhaust pipe is clogged or of too small diameter, the diagram will show an exhaust curve that rises toward the end, such as *ABDC* in Fig. 30, and produces a harmful back-pressure on the piston. The upward arching of the curve at *DE* indicates an extra cause for compression and is due to too-early closing of the exhaust valve. The motor in this instance is also late in opening the exhaust valve, as the expansion curve extends all the way to the dead center before the drop from *A* to *B* begins, while this first part of the exhaust curve should run as *AB* in Fig. 28. Owing to all these defects, the area of the diagram, Fig. 30, is naturally much contracted, indicating reduced motor power.

If the exhaust valve is opened too early, the expansion curve drops suddenly from *A* to *B* as in Fig. 31, and the useful area of the diagram is again reduced.

Indicators may be used to advantage not only to determine the action taking place in the cylinders but also for other organs. By mounting a single indicator on the exhaust pipe, one obtains curves of the exhaust pressure, from which the value of the muffler may be estimated. Figs. 32, 33 and 34 show such exhaust pressure curves for a six-cylinder motor running at 560 r.p.m. Fig. 32 shows the result of using a muffler which gives a rather high back-pressure. The muffler used for Fig. 33 is shown to have been of more suitable design, as here the curve at both ends coincides with the horizontal line representing atmospheric pressure. Fig. 34 represents the curve obtained without using any muffler, and it is noticed that in this case there is a rhythmic succession of pressures and depressions in the exhaust pipe.

The Trade Value of Indicators

As may be judged from the foregoing, most repairmen could learn to use an indicator to advantage for quick diagnosis of motor troubles. Most motors have compression cocks where the indicator may be connected. Its cost is not high. Photographic apparatus may be dispensed with for most purposes, and then a single, rather than a quadruple indicator, will do. The motor need not be dismounted. Improved construction is gradually taking indicators from the laboratory into the trade.

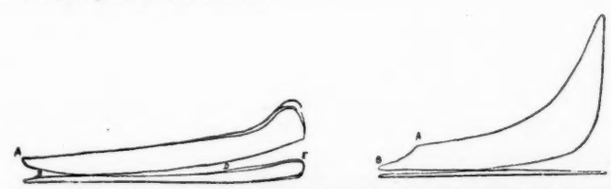


Fig. 30—Exhaust obstructed and exhaust valve closes too early and opens too late. Fig. 31 (right)—Exhaust opened too early

Figs. 32, 33 and 34—Diagrams of exhaust pressure with poor muffler, better muffler and no muffler, respectively

"The Car That Stays Young"

An Incipient Department for Data on Durability

DURABILITY is a homely virtue with small charm. Its light is under a bushel. Its importance is recognized in a general way, of course, but in practice it is a subject for guesswork. The use of alloy steel with anti-fatigue properties is an appreciated feature in construction. Broad plain bearings working under small specific pressures or anti-friction bearings are employed with a view to durability. A reliable lubrication system is understood to be necessary. And the ready exchange of wearing parts is becoming a characteristic of conscientious design. But, apart from these elements in the power plant to which engineers naturally pay close attention, few attempts are made at analyzing the requirements for durability in an automobile or a motor truck into its components, although nearly every portion of an automobile is a working part in the sense of being exposed to severe wear and tear through active and shifting relations to the road, the load, the weather and the traffic. In an article entitled "The Car That Stays Young," which appeared in THE AUTOMOBILE for Sept. 2, 16 and 30, the writer referred to a number of these design features in an automobile which are stationary in relation to the vehicle but become working parts when the vehicle moves over the road, and it was suggested that a great deal might be done for increasing the durability of the automobile as a whole if design and materials for these parts were studied with close consideration for their Durability in its Relation to Cost and Style, in the same manner as durability is studied in the power plant and the transmission mechanism, including the tires.

Real Data Not Obtainable

In the belief that some data on this subject, based on comparative tests, were in the possession of the industry, and that they would interest the automobile-buying public—who without this information drift toward the lowest price consistent with a temporarily attractive appearance—an attempt was made to obtain such data by correspondence with manufacturers' purchasing agents, who are always deliberating questions of quality and price, and from specialty and material makers, but the responses have shown that real data in this large field are either guarded as secrets or have not yet been systematically gathered. Many are willing to admit that their own productions are exceptionally durable and that it would be very desirable to have the public understand that such durability is an excellent reason for high prices. Others are interested in features or materials which look highly promising, being intended to obviate deficiencies in other features or materials so far more generally employed. But nobody seems willing to believe that increased durability often can be attained without increase in the cost of production, solely through a better choice in design or a better knowledge of facts relating to materials. Yet, a durability that costs all it is worth is not so very alluring, and the writer still believes that a great deal of durability goes by default for lack of a SEPARATE study of the subject and SEPARATE publicity for the results of such a study. For the present, however, it seems that the idea of obtaining real data without giving a large amount of time and effort for obtaining them must be abandoned, but there remains the possibility for keeping the study of the subject open on less exacting lines, by means of such contributions as may be received, whether they stick closely to real data or not. In this manner the relation of durability to cost of production and price cannot be brought out sharply, and the ideas on durability will usually be found somewhat interwoven with individual preferences in matters of construction and style or with a too-optimistic faith in promising innovations, but, after all, durability will be kept in the foreground as a subject for inquiry and by degrees will disentangle itself from its complications.

With this modification in tactics, still coupled with the hope that the "stationary working parts" of the automobile may receive their due share of attention, two interesting contributions which show the trend of public opinion, are presented herewith.

An Owner-Driver's Views

Office of Harvard University
The Inspector of Grounds and Buildings

Editor THE AUTOMOBILE:—I have read with much interest the series of articles in your magazine on "The Car That Stays Young." These articles pointed out certain components of the automobile deserving of investigation with a view toward making them more lasting, and indicated the desired results, with suggestions in some cases for their attainment.

One item of the utmost importance which has not yet received attention in this series is that of automatically lubricating all the parts of the chassis now cared for by separate and more or less inaccessible grease-cups, by oil cups and in many cases, such as the springs, by no provision at all.

The average owner who cares for his own car is bound to shirk the filling of grease-cups that are so located as to require a suit of overalls and a subsequent bath for their proper attention. Even when a chauffeur cares for the car, his free time is not always sufficient to give such daily details the best attention.

Owners of medium priced cars who care for them themselves prefer if possible to turn them in each year, rather than be subjected to the annoyance and expense of overhauling made necessary mainly through neglect of lubrication and cleaning. We hear criticisms offered of certain cars, that they are "one year cars," or "10,000 mile cars." This usually means that lubrication is so difficult or badly provided for, that at the end of one year or of 10,000 miles, many parts have worn loose, that the very annoyance of squeaks and rattles drives the owner to turn it in, or else overhaul. These cars have vastly better materials than were used ten years ago. But they wear no better, because dirt and lack of lubricant will wear the best bearing or bushing material made as quickly as the poorest.

If an automobile was so designed that its complete lubrication was a simple, clean and rapid task, and if the lubricated parts were protected from water and dirt, it should be in practically the same running condition after 10,000 miles as after 500.

The present large sales of medium price cars are increasing the number of owner-driven cars in far greater proportion than the number of chauffeur-driven cars. Consequently a development in design which would make it easier for an owner-driver to keep his car at top-notch efficiency, and keep it there a long time, would be an aid rather than a detriment to sales.

Such a car, the "Fergus," has been designed and built in Ireland, and is described in two recent numbers of *The Autocar* of London, England. The editors of that authoritative publication have felt that the production of the "Fergus" is so important that they devoted several pages of editorial to it, as well as a description running in two issues.

I have awaited with interest comment in THE AUTOMOBILE on this car. I hope you are going to say something about it.

Although the design of such a car involves a change in design of many components now standardized, I believe that the time is coming when a car with unlubricated and unprotected springs and steering connections, inaccessible brake parts and a complicated distribution of little, dirty grease-cups in hidden corners; will be as unmarketable as solid bicycle tires.

Cambridge, Mass., Nov. 18, 1915. MAURICE M. OSBORNE.

The subject of convenient lubrication methods as the first and foremost means for making a car stay young has not been overlooked. It was in fact treated by the writer, exactly in this spirit, in an article appearing in *Review of Reviews* in 1906 or 1907. But it was omitted here on account of being complicated by constructional difficulties. It remains to be seen whether these have been overcome in the Fergus car. The builders of this new car have taken the radical and logical step of eliminating watchful waiting from among the duties of the caretaker. Lubricating the car, with their system, is changed from a series of odd jobs to be performed with difficulties and at no particular time—and therefore in practice nearly always after some harm has already been done by neglect—to a filling of reservoirs taking place every six months, for example Jan. 1 and July 1, all the rest being automatic. In the history of American automobiles the Overman steam car furnishes an instance of highly ingenious automaticity, but the automatic features eventually failed unexepectedly by reason of minute cumulative effects in the operation. Some little scepticism may perhaps be entertained as to whether the automatic features in the lubrication of the Fergus car will entirely avoid this danger. The cost of production is another problematic point in this car, since durability can be bought too dearly, especially so long as the ideal of the "one-horse shay" has not been reached in all its components, or finality in its design. Original blueprints of the Fergus car have been secured, however, and readers of THE AUTOMOBILE will be enabled to study its highly interesting construction in a week or two under the expert guidance of Mr. A. Ludlow Clayden.

One Voice from the Industry

The Wayne Works

Editor THE AUTOMOBILE:—We were very glad to note in your circular of the 8th that you are arranging a symposium on the matter of "The Car That Stays Young." It is a point to which more attention should be paid by the public; it is a point to which more attention should be paid by the engineer; it is a point to which more attention should be paid by the heads of motor companies.

The secret of durability is pre-eminently the use of the best material in the right place. Granted, of course, that at least common sense designs are used and that a rational idea of quantity of material is also used. Given two cars of approximately the same weight and power, using approximately the same general dimensions as to parts, the life of the one using inferior material will probably be not over half or two-thirds that of the one using the best material. The use of the very best bearings, the use of alloy steels, the use of testing laboratories, the use of proper heat treating departments, will undoubtedly add to the price of the car. If the American public were willing to pay the difference to gain the car of the best material over the car of mediocre material, the standard of car design and engineering would be very much higher than it is to-day. The fact of the matter is that the public will not pay this price and since the manufacturer has found that his sales are increased by reducing in price either to afford better selling argument for his own car or meet the competition of his rival, to gain this lower price he must inevitably sacrifice quality of material. He, therefore, instructs his engineers to use cheaper bearings, to use cast iron instead of aluminum, to lighten the weight here and there to save stock, to do away with several inserted bushings at various points of wear about the car and probably to continue with an old design modified rather than go to the expense of adopting a new and more modern design. We would all like to make the finest cars that we could, but we can all sell most easily the cheaper car. I use "cheap" in the sense, of course, of not going below a certain standard of engineering and quality of material. A "cheap" car and one that is "cheap" only will not be in the market long, simply because the people will get to know it and it cannot sell at any price. To be sure there have been great economies in factory practice recently. It is much less expensive to manufacture 40,000 crankshafts than 400, but even this does not explain the reason why one car of a certain type, weight and horsepower will sell at $800, while another car of undoubted durability and proved reliability but approximately the same size, weight and horsepower, must sell for $2,500 or $3,000 in order to insure its maker any profit at all. Of course, the American attitude recently has been to buy a car, usually at a reasonable price, use it a year or two and either sell it and buy a new one or trade it in on a new car, not realizing that they must inevitably stand such loss as is also inevitably bound to occur. The buying public properly guided by advance engineering ideas is the final arbiter of automobile design. At present the buying public is decidedly insisting upon low-priced cars. The sort of people who insist on low-priced cars in order to have a car do not get nor expect to get the quality of material and consequent durability and long life of the car that is sold to people to whom first cost is not the prime object and who are accustomed to paying the higher prices in order to obtain the rarer design and the better quality of material. This applies just as well to a suit of clothes as to an automobile. If the buying public insists on buying completely equipped touring cars for $750, touring cars at $750 will be furnished them and the cars will have just exactly $750 worth of value in them and no more. If they want to buy $5,000 cars they will get cars for which, when their durability, comfort, and convenience are considered, the price of $5,000 is not exorbitant, and no rational person can believe for a minute that the $700 car can in any way compete as far as life, comfort and convenience goes, with the $5,000 car. It is most unfortunate that this insistent demand for low priced cars has come about and it is most unfortunate chiefly for the buying public.

Quality of material is, therefore, the first factor to be considered in "the car that stays young." The other point is of course attention and use or, more properly, lack of attention and abuse. A $700 car carefully lubricated, adjusted and handled will give a surprising record as to durability in comparison with a $5,000 car recklessly abused, not lubricated nor attended to in any way.

I hardly agree with the general tone of the third paragraph of your letter for the reason as given above; namely, that reduction of material in either weight or quantity cannot go below a certain point because the natural law of minimum will shortly wipe that car out of existance which does not give at least the service that should reasonably be expected from a car of its list price. In many cases the reduction in the cost of production will result in an increase of durability. For instance, a semi-steel crankcase is probably stronger than an aluminum one. It is at any rate much cheaper but has the disadvantage of increased weight. The modern demand for cars of light weight results in too much material being taken away from the car to a point which, even with the use of modern expensive and durable alloy steels, removes the factor of safety which every car should have. The only way to overcome this disadvantage is to so increase the quantity of production that the economies gained thereby will make up for the additional expense entailed in the use of better material. The reason, to be concrete, why Henry Ford sells so many cars in the course of a year is not the fact that his car sells for $440 which is within the price range of practically anyone, but that it gives even a great deal more service than should reasonably be expected from a car selling at that price. The secret of the efficiency of the car is light weight gained by the use of good material. The secret of the reason that it costs $440 instead of $1440 is that the great economies effected by the quantity production completely absorb the increased expense of better material.

The best way to produce "the car that stays young" is for the man who buys the car to be willing to pay a few hundred dollars more for better material, better design and consequent durability, rather than to pay a few hundred dollars less in order to save money by purchasing a cheaper car; and the only way to gain increased durability by use of high priced material and still keep the car within the range of the purse of the man who does want to buy the car for the few hundred dollars less is by quantity production.

THE WAYNE WORKS.
Per WARREN CLEMENTS,
Wayne, Ind., Oct. 18, 1915. Mgr. Automobile Dept.

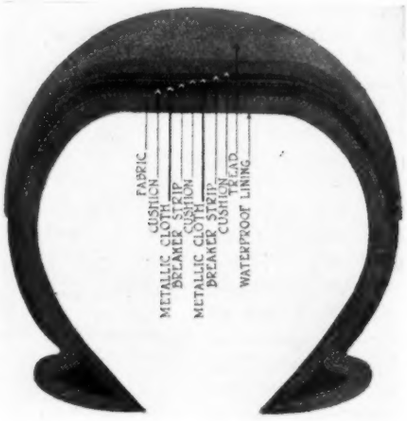
The letter by Mr. Clements represents, in the writer's opinion, the general truth in the situation, as between durability and price, but a truth to which the exceptions are so numerous and important that they deserve to be studied especially. It might even be said that it is for the purpose of studying these exceptions—which individual ability and special knowledge never fail to create in order to take distance from the average standard—that a column is kept open for "The Car That Stays Young." With any other view on the subject it would be necessary to assume, it seems, that all cars of the same price are of about the same durability in every feature.—M. C. K.

ACCESSORIES

Traveller Puncture-Proof Tire

WHILE Traveller tires are no heavier than other pneumatic tires of equal quality the manufacturer guarantees them to be puncture-proof and states that they lessen blowout troubles 50 per cent. Of approved construction throughout, these tires have several distinguishing features. The puncture-proof quality is obtained by the use of two unbroken strips of elastic metallic cloth which completely cover the tread, being vulcanized right into the body of the tire. This metallic cloth is said to be ten times stronger than the best quality fabric. As may be seen in the accompanying illustration, the inside of the casing is covered with a water-proof lining which protects the fabric and body of the tire from the effects of moisture, as well as imparting additional strength. Above this are numerous layers of fabric under a thick rubber cushion as indicated. Above this comes the first strip of metallic cloth, which is first chemically treated and then rubberized, being embodied right in the tire structure, so that while it is completely surrounded by rubber it is flexible and resilient. Above this is the first breaker strip and the second cushion, after which comes the second strip of metallic cloth, which is not quite as wide as the first. The extra breaker strip, another cushion and an unusually thick clear rubber tread complete the tire.

Another distinguishing feature, which may be seen in the illustration, is the square formation inside the tread, which not only permits a much thicker tread section but also prevents straining the fabric at any point. It also prevents the bevel which occurs with the ordinary round tire when not fully inflated, resulting in blowouts. The manufacturer states that these tires do not overheat. They are guaranteed puncture-proof up to 5000 miles, a new tire being given in exchange for one defective in this respect. Traveller tires are made in both plain and non-skid treads.—Traveller Tire & Tube Co., Inc., New York City.

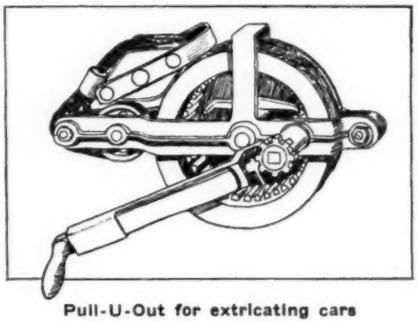


Traveller puncture-proof tire

Pull-U-Out for Extricating Cars

A device to help the motorist when his car becomes stuck in the mud or to be used for any of the thousand-and-one circumstances where it is necessary to exert a strong end pull has been brought out under the name of the Pull-U-Out. It is merely a conveniently arranged set of pulleys with a handle for turning so arranged that the total reduction is 70 to 1. The mechanism is quite simple, consisting of a substantial winding drum with gears inside which engage a small bronze gear on the end of a long ratchet crank. Attached to this there are 40 ft. of steel rope with 5000 lb. capacity, and a pulley with two 7-ft. light-weight chains having hooks on each end to complete the pulling device.

The stakes can be readily driven into the ground, but on a straight pull cannot be removed by fifty men pulling with all their might. When the pressure is released and they are pulled up at the correct angle they come out easily. Some of the purposes for which the Pull-U-Out can be employed are, besides removing a car from the mud or sand, lifting a motor from the chassis, towing a car, for a derrick on the rear end of a truck handling heavy baggage, towing a boat through mud, etc The complete outfit sells for $15.—Pull-U-Out Sales Co., St. Louis, Mo.

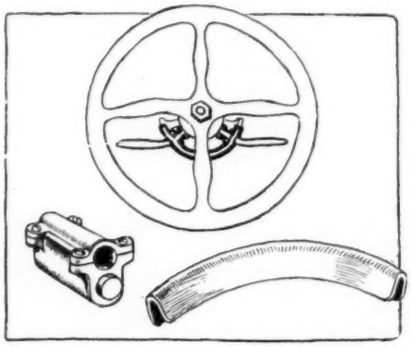


Pull-U-Out for extricating cars

Premo Gas and Spark Sector

The Premo is a neat and easily applied friction sector for the Ford steering wheel to permit a finer regulation of throttle and spark than can be obtained with the original toothed arrangement and also to replace the latter should it be worn.

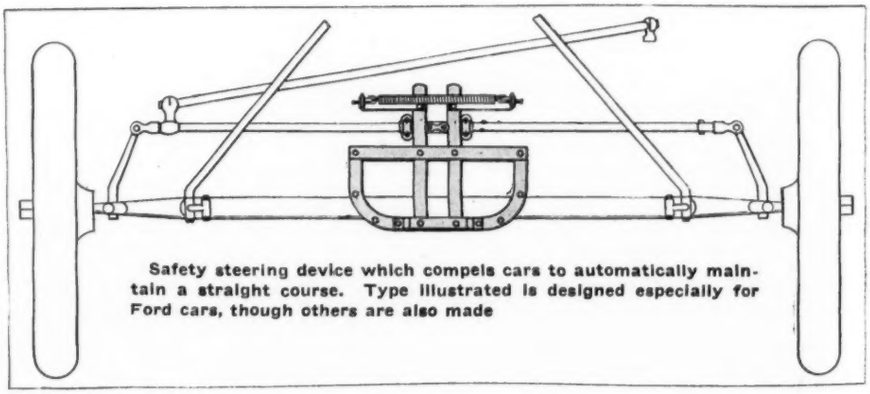
A pressed metal sector slips on over the regular Ford sector and the friction members are attached to the levers, the only tool required being a screwdriver. The device is attractive in appearance and permits the levers to be set at any number of positions. Price, $1.—N. Y. Motor Car Device Co., New York City.



Premo gas and spark sector for Ford cars

Dead Easy Tire Pump

The Dead Easy is a two-stage compression pump operated by a long handle, there being two pairs of cylinders in tandem, each large cylinder having a bore of 3½ in., being surmounted by a small one of 1⅝-in. diameter. A piston rod passing through the dividing head connects the two pistons of each cylinder, the packing in the dividing head acting as a valve in that it allows air to be forced upward from the large cylinder into the small one but prevents its



Safety steering device which compels cars to automatically maintain a straight course. Type illustrated is designed especially for Ford cars, though others are also made

return. A rocker arm is connected with each large piston at the bottom and this is actuated by the handle. The connections are such that the pistons move rapidly at the beginning of the stroke when the pressure is light and slowly toward the end of the stroke when the pressure is greater. Air compressed in the large cylinders is transferred at about 40 lb. to the small ones and thence to the outlet. The pump is 5 by 8½ in. and 9 in. in height and the handle comes in two sections, each 16 in. long. The weight of the device is 13 lb. With cylinders and trimmings nickeled, and other parts black enameled, the pump sells for $15; when the outfit is entirely enameled, $12.50.—Globe Mfg. Co., Battle Creek, Mich.

Safety Steering Devices

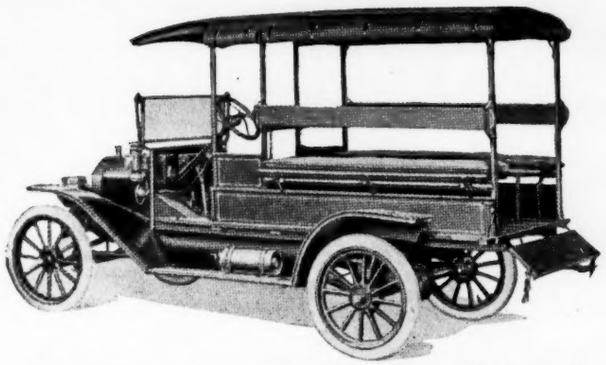
A device to compel cars to automatically maintain a straight course has been devised and is being marketed under the name of the Auto Safety Steering Device. The apparatus is stated to work satisfactorily even when the tie rod has been detached or broken, thereby greatly increasing the safety of the car. A diagram illustrating the principles of the mechanism and its application appears herewith. The device is clamped to the front axle and the cross arm is brought to its central position by a coil spring which acts in either direction. This device is specially designed for Ford cars and can be applied quickly without any machine work.—Safety Steering Device Co., New York City.

Prest-O-Lite Cooking Outfit

A hot-plate is set on four legs and fitted with a special burner for using acetylene gas from the Prest-O-Lite tank. A rubber tube is slipped over the tank union and the gas turned on and lighted. If the tank is used for lighting on the car the lamp tube is first slipped off. The stove packs into a box measuring 8 by 8 by 5 in. and weighs 6 lb. The makers state that with full flame the gas consumption is 3½ ft. per hour. The full flame will boil a quart of water in 3 min. and is too hot for average cooking. Cost of operation, 8 to 15 cents per hour. The illuminating burner attachment can be used in camp and permits the use of the lighting and cooking feeds separately or together. Tubing is supplied with the stove. Price, stove only, $4.50; stem and illuminating burner, 55 cents; two-way valve for simultaneous cooking and illuminating, 75 cents.—Prest-O-Lite Co., Inc., Indianapolis, Ind.

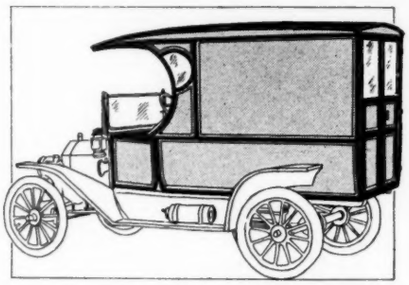
Henney Bodies for Ford Cars

To meet the demand for an economical delivery car which can be mounted on a chassis of standard design, the Henney bodies have been put out to fit the Ford model T. The complete line comprises seven individual types of bodies: the steel panel in two forms; the general utility with top and flareboards; the general utility with flareboards alone; the steel panel roadster box, which fits behind the regular roadster model; the open flareboard runabout body which also fits behind the roadster driver's seat, and a general utility body with removable side seats and rear steps.

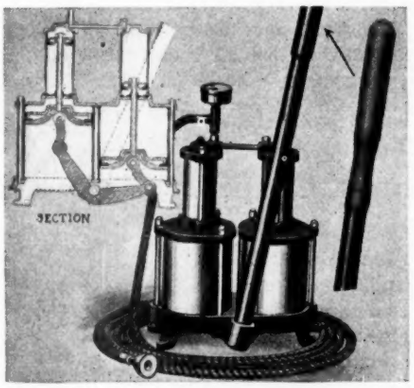


One of Henney Buggy Co.'s open bodies for Ford chassis

This complete line can be varied by different attachments so that all requirements for a light commercial car can be satisfied. The net weight of these bodies varies between 80 lb. and 405 for the steel panel. The prices of the bodies are $99 for the best steel panel, $84 for another model steel panel, $67.50 for a general utility with top and flareboards, $45 for the general utility with flareboards alone, $24 for the steel panel roadster box, $18.75 for the open flareboard runabout body and $90 for the general utility body with removable side seats and rear step.—Henney Buggy Co., Freeport, Ill.



A Henney closed type for Fords



Dead Easy tire pump

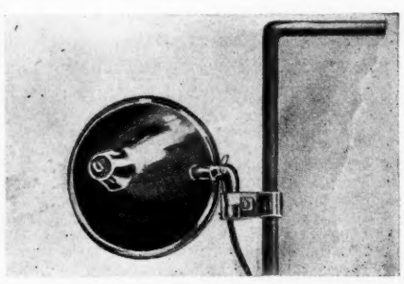
Prest-O-Lite cooking and lighting outfit

Excelite Spotlight

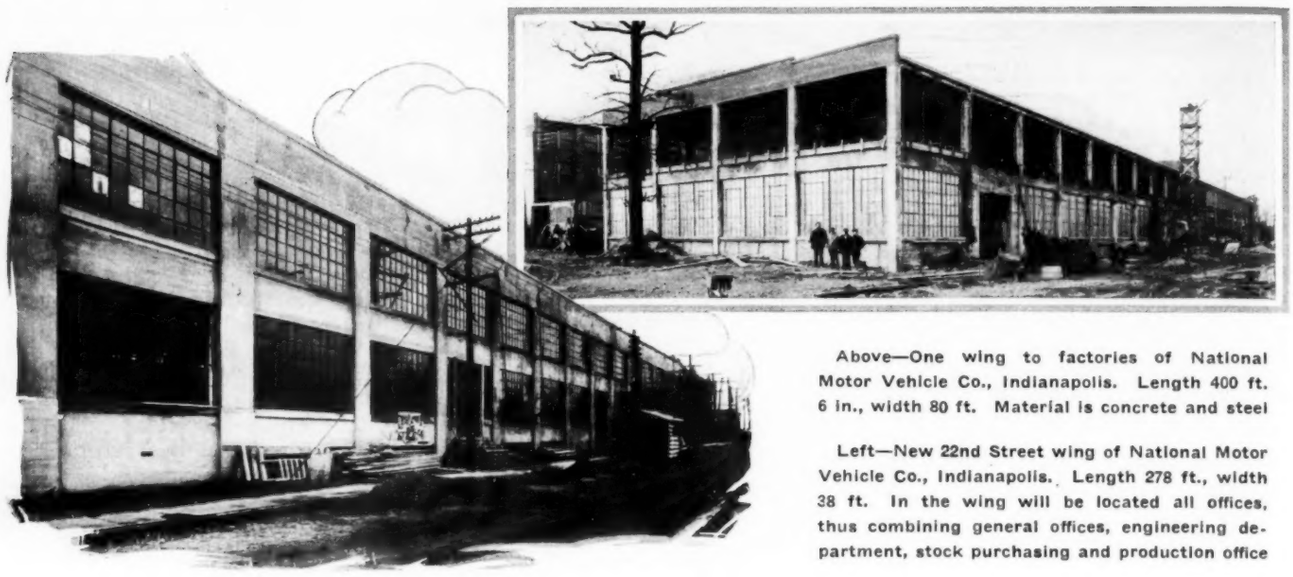
This convenient spotlight has universal joint provision for mounting on the windshield or dashboard, and is useful for inspecting signs, etc., out of the range of the headlights, while it can also be used to illuminate the motor when repairing or adjusting. A switch and a focus adjustment operated from the outside are located at the back of the lamp. The reflector is 7 in. in diameter. A special type is made for operating on the Ford magneto current and two sizes for truck service, being designed for clamping at the top of the dashboard. The plain type sells for $6 each, while the De Luxe type, with nitrogen bulb and armored cable, is $7. The truck type costs $6 for the 7-in. size and $7.50 for the 9-in.—J. H. Faw, Inc., New York City.

McKinnon Tire Holder

Made in two types, for one and two tires. They attach to running board and fender at right of front seat.—McKinnon Dash Co., Buffalo, N. Y.



Excelite swivel lamp on windshield



Above—One wing to factories of National Motor Vehicle Co., Indianapolis. Length 400 ft. 6 in., width 80 ft. Material is concrete and steel

Left—New 22nd Street wing of National Motor Vehicle Co., Indianapolis. Length 278 ft., width 38 ft. In the wing will be located all offices, thus combining general offices, engineering department, stock purchasing and production office

New National Factory Buildings Near Completion

OVER 500 men are working overtime to complete the new factory buildings of the National Motor Vehicle Co., Indianapolis, Ind. The officers of the company hope to be in part of the new buildings in fifteen days and expect to have all of the increased space within thirty days. The new buildings are two stories high and 675 ft. long or approximately two city blocks. One is 38 by 278 ft. and the other 80 by 400 ft. They will cost $100,000. One of the new buildings will include the general offices and in the same building are new quarters for the engineering and production departments.

Geo. M. Dickson, general manager of the company, states that there are three times as many orders on hand than ever before in the fifteen years' existence of the company. He goes on to state that the new buildings will greatly facilitate matters in increasing production to meet the demand and in relieving to great extent the strain on the various departments. They will also reduce the cost of production.

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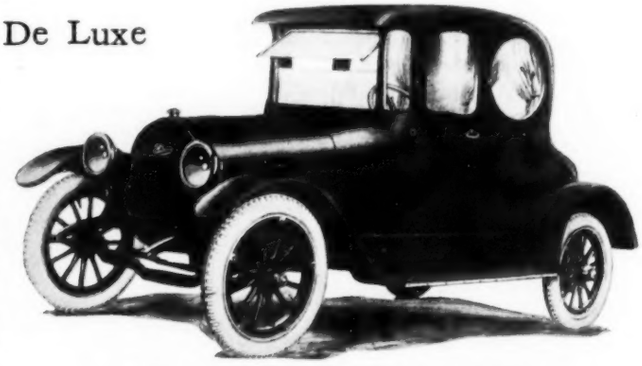
Features of the Pullman Coupé De Luxe

THE Pullman Motor Car Co., of York, Pa., in bringing out its De Luxe coupé has given special attention to the requirements of women automobilists by equipping the car with the C-H magnetic gearshift and by combining city design with all the power necessary for touring. The general effect is of easy flowing lines, even to the rounded corners of the windows. Seats are extra wide with deep cushions and upholstering of broadcloth. The general interior finish is similar to that of an electric, although less attention has been given to the niceties of boudoir equipment such as mirrors, receptacles for toilet articles, etc., than to improving the mechanical features of the car to render it suitable for women's use. The car sells for $990.



Pullman De Luxe coupé which lists at $990

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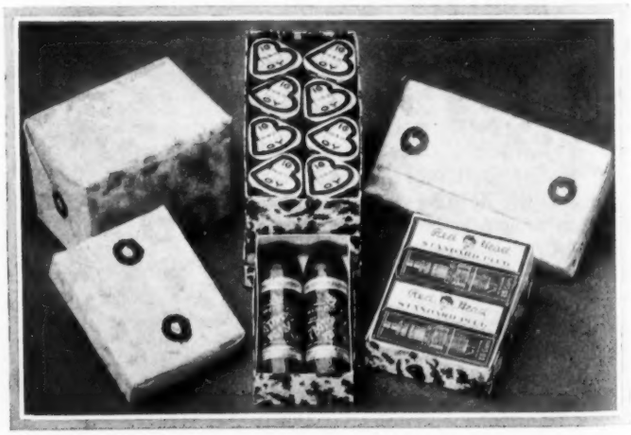
Grossman Xmas Gift Packages

IN keeping with the Christmas spirit the Emil Grossman Mfg. Co., Brooklyn, N. Y., is putting out several gift packages of spark plugs appropriately packed for presentation. These packages may contain an assortment of spark plugs suitable for any particular car and also for motorcycles. Following is a partial list and retail prices of the Red Head gift packages:

8 Big Boy Plugs, ⅞ in.—18 only	$8.00
6 Big Boy Plugs, ⅞ in.—18 only	6.00
4 Standard Plugs, all threads	3.00
6 Standard Plugs, all threads	4.50
4 Priming Plugs, for Ford, all threads	5.00
(One Priming Can Free with each set of four Priming Plugs.)	
2 Platinum Metric Motorcycle Porcelain Plugs	3.00
4 Long Body, for Ford, Overland, Reo, Maxwell and Studebaker	3.00
4 ⅞ in.—18—½ in. extension for Buick and Chalmers	3.00
6 ¾ in.—18—½ in. extension for Buick and Chalmers	6.50



Christmas gift packages of spark plugs prepared by Emil Grossman Mfg. Co., Brooklyn, N. Y.

THE AUTOMOBILE

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Body Capacity

MORE than ever before the advertising departments of our manufacturers have exploited the roominess of tonneaus. Sales departments have in more than one case forced the engineer to enlarge the body till its dimensions are the limit the chassis can carry, so that the seven-passenger car has a really very large floor area. Why this demand for more seven-passenger machines? Why the cry for more and more room in bodies of every capacity? A little experience in the use of a number of the new cars shows that many of them are altogether uncomfortably big except when filled to capacity, and even then there is often waste space not occupied. In the heat of summer this is all very well, but for more than six months of the period during which automobiles are most in use draughts are rather to be avoided than to be desired, and an open touring car becomes draughty in proportion to its floor area.

There are thousands of people who only desire a four-seated car, thousands who have not the least desire to carry more passengers than this number, and for such the close-coupled style of body is infinitely preferable. Driver and tonneau passengers get close enough to enable conversation to be carried on, there are few draughts, there is greater comfort, because all passengers come well within the wheelbase and some weight is saved. Thus we wish to enter plea for a type of body which seems to have a great field; to ask manufacturers not to neglect the demand for a body that comes between the big seven-seater and the clover leaf. The demand exists for all classes of automobiles from $500 to $5,000.

Electrical Development

ELECTRICAL automobile equipment is a great deal better on the 1916 cars than it was with the 1915 models; the generators and motors are better, the batteries are better, the wiring and petty details also better. Perfection is still a long way off, however, and electrical equipment cannot be regarded as having yet attained more than a distant approach to the ultimate form because of the infinite variety observable at the present time. Among the numerous machines and types there may be two or three which will be permanent, but it would be foolish to try prediction as to which is the most probable future type.

But, we may chronicle a distinct stage in development; we have reached a point where the engineering quality of the machines is of a high order, and development will be along manufacturing lines rather than those of scientific experiment.

The automobile manufacturer can choose among a great variety of systems with confidence that any will give satisfaction to his customers, so the industry is being freed to give consideration to matters of detail rather than of principle. It will be some years yet before the electric apparatus on the average automobile will be as self-preserving as the magneto, though some parts of it have already attained almost the same degree of reliability. A comparison of reviews of the electrical accessories to-day, last year and the year before is very interesting, as it shows the tendency toward simplification all along the line, and the record of progress in this field is quite as remarkable as any other record in connection with history of the most remarkable trade in the world.

Marking Time

WITH the end of November there are left but a few new models of passenger cars to be announced this year. At the Show there will not be many surprises, the wonderful engineering development which began about September, 1914, has produced a huge crop of new designs, of which announcement has been made month by month since the last New York Show. At the shows just coming we shall see the results of a progress that was exhibited in an early stage only, at the shows of last January. Undoubtedly we would not anticipate many new cars to appear in the early months of 1916.

The designs of 1916 are on trial in the hands of the public; they are largely different from the designs of any previous year and engineers will wait for the public's verdict, and this will hardly be forthcoming till the summer. Thus it seems reasonable to expect 1916 to be a year of consolidation rather than of creation in the engineering field. It would not be reasonable to expect the immense pace of last year's progress to be maintained.

G. E. Buys Interest in Owen Co.

Entz Motor Patents Corp. Is Formed to Control Entz Electric Patents

NEW YORK CITY, Nov. 30—The General Electric Co., Schenectady, N. Y., has secured a substantial interest in the R. M. Owen Co., manufacturer of the Owen magnetic car and controller of the patents of J. B. Entz on electric transmission systems as employed in this car. Co-incident with the appearance of the General Electric Co., in this movement is the organization of the Entz Motor Patents Corp., which will control all of the Entz electric patents and also has a license to use all of the General Electric patents that will be helpful in the Entz electric system. This new corporation is capitalized at $6,000,000, made up of $5,000,000 common and $1,000,000 7 per cent preferred. The stock is not placed on the market.

The General Electric Co., has already begun tooling up its Fort Wayne, Ind., factory for the manufacture of the electric unit for the Owen company, and all other concerns that will be licensed by the Entz Motor Patents Corp., to use the Entz transmission system. The Fort Wayne plant is one of the best ones of the General Electric and is centrally located for the automobile industry, being close to Detroit, Cleveland, Toledo, and all of the large automobile centers in that section.

To Increase Production

Under this new arrangement the R. M. Owen company will continue the manufacture of the Owen magnetic car at its factory where 100 of the cars have already been completed and production has started on a second run of 500. Production will rapidly increase.

R. M. Owen will be president of the Entz Motor Patents Corp., and E. S. Partridge will be sales manager.

It has been known for several months that the General Electric Co., has been deeply interested in the Owen magnetic. Last July the General Electric made a very exhaustive test of two Owen magnetic cars which were driven from New York to their laboratories where tests on the efficiency of the electric transmission system were conducted, these extending over two days. These tests were entirely satisfactory, and after the tests were completed, the Owen cars were given road test under the direction of W. P. Potter, chief engineer of the railroad department, and C. E. Stone, manager of the lighting department, in company with Henry Chatain, who has charge of the gasoline-electric department of the company. In the road test the cars were driven from Schenectady to the General Electric factory at Erie, Pa., and thence to Pittsfield, Mass., thence to Lynn, Mass., and finally back to New York. In the meantime a hill-climbing competition was carried out on Kennedy's Mountain, near Cornwall. This mountain has a grade of 17 per cent for 2000 ft. and 11 per cent for 3000. Here ten of the engineering corps of the General Electric put the Owen cars through their final test. It was as a result of this road performance that the General Electric decided to secure a substantial interest in the Entz patents.

The Carl H. Page Motors Co., 350 North Broad Street, Philadelphia, has taken the agency for the Owen magnetic, and will have a formal opening Dec. 13. R. D. Willard is in charge.

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Elcar Price Raised to $795

ELKHART, IND., Nov. 26—The Elkhart Carriage & Motor Car Co., this city, maker of the Elcar, has raised the price of its 1916 cars from $775 to $795, owing to several changes in construction.

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Cassidy Leaves Johns-Manville to Head New Selling Co.

NEW YORK CITY, Nov. 27—E. A. Cassidy on Jan. 1 will sever his connection with the H. W. Johns-Manville Co., this city, as general manager of the automobile accessory department to become president of the Edward A. Cassidy Co. The new company will be a selling organization and will market the entire products of several automobile accessory and parts makers. The company will sell solely to jobbers and automobile makers, and will have its headquarters in New York with branch offices in Chicago, Detroit, Boston and San Francisco.

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Plummer Leaves Locomobile

NEW YORK CITY, Nov. 30—John F. Plummer, manager of the Locomobile branch in this city has resigned to take effect Dec. 1. Mr. Plummer is one of the oldest dealers on the Broadway Row, and has been with the Locomobile company practically sixteen years, starting with them Jan. 1, 1900 when he started work in the factory at Newton, Mass. Later he became a salesman in the New York store; following this he opened the Philadelphia Locomobile business, and made a trip to the Orient. On his return he was manager of the Locomobile branch in Chicago, and Jan. 1, 1903, became manager of the New York branch. Mr. Plummer is one of the best known dealers in this city. It is not known yet what new enterprise Mr. Plummer will follow. His successor has not yet been appointed.

Premier Plant Sold to Syndicate

Offer of $125,000 Accepted—To Continue Manufacture of Premier Cars

INDIANAPOLIS, IND., Dec. 1—The plant of the Premier Motor Mfg. Co. has been sold to a syndicate represented by F. W. Woodruff, banker, of Joliet, Ill., for $125,000, the sale being confirmed by the court here to-day. The bid of the syndicate for the property, which included all the plant except the real estate, was filed with Frank E. Smith, trustee in bankruptcy of the company, who announced on Saturday that the plant had been sold.

The interests represented by Woodruff propose to re-finance and to revamp entirely the Premier organization and to continue the manufacture of the Premier car. It is understood that sufficient capital is back of the organization to make the Premier concern an important factor in the industry.

1 Year in Receivership

The financial difficulties of the Premier company date from December, 1913, when arrangements were first made with the creditors. The receivership which has just terminated with the sale of the property dates from Oct. 15, 1914, at which time Frank E. Smith was appointed receiver. On Dec. 15 Mr. Smith was elected trustee of the organization and has been looking after its welfare ever since.

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Carload Shipments Gain 100%

DETROIT, MICH., Dec. 1—An important meeting of the directors of the National Automobile Chamber of Commerce is in session here to-day at the Detroit Athletic Club. While complete report of the deliberations cannot yet be obtained, General Manager Alfred Reeves says that the committee has the matter of Safety First under consideration and that a report to the gathering indicated that carload shipments of automobiles have increased 100 per cent over a year ago. It has practically been definitely decided to fix the standard tread at 56 in. for all sections of the country, discontinuing the 60-in. width which has been supplied to Southern trade.

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Dayton Resigns from New Era

JOLIET, ILL., Nov. 26—W. O. Dayton has resigned as chief engineer of the New Era Engineering Co., this city and has organized a company for the manufacture of light automobile chassis and light worm drive axles for local and export trade.

Tax Coal, Wood, Electricity, Oats, Hay—if You Tax Gasoline

Washington's Proposed Tax of 1 Cent Per Gal. on Gasoline Is Class Legislation—Automobile Organizations to Fight It—General Opposition to Measure

NEW YORK CITY, Dec. 1—The federal government's proposal to raise a part of its extra revenue of $112,000,000 by placing a tax of 1 cent a gallon on gasoline used, and also placing a tax on motor vehicles, according to horsepower, which was first mooted a year ago, has again been voiced by Secretary McAdoo. This amount of additional revenue is claimed to be necessary for the fiscal year ending July, 1917.

825,000,000 Gal. Used

On the present schedule of car production there will be approximately 3,000,000 cars in America July 1, 1916, this figure covering passenger cars only. On a conservative estimate these passenger cars will consume 825,000,000 gal. of gasoline per year, this being based on an average mileage of 5000 per car, and assuming that 1,500,000 cars will average approximately 20 miles per gallon, and that the remainder of the cars will average 15 miles per gallon. This fuel average is too high but makes the figures proportionately conservative. On this basis of calculation passenger cars alone would produce a revenue of $8,250,000.

But a tax of 1 cent a gallon will fall on every commercial motor vehicle and it is impossible to estimate the fuel consumption of these. Further, there are hundreds of thousands of stationary engines using gasoline, these being in grain elevators, on farms, in factories, and hundreds of other places. Further, there are thousands of traction engines employed on farms, and in other vocations using gasoline. Yet again, there are tens of thousands of gasoline farm tractors using this fuel.

Of National Importance

In a nutshell, gasoline is no longer a fuel used for the transportation of the rich but is as essential to-day for the carrying on of the nation's work as kerosene is for lighting purposes, in our farming communities. It is just as unfair to tax gasoline as it would be to tax kerosene. It is practically as unfair to place a tax of this nature on gasoline as it is to place a tax on food supplies.

Why tax the gallon of gasoline and not tax the kilowatt of electricity? Electricity is used to-day for lighting, and for power. There is no difference, at least there should not be any difference between the manufacturer who transports his products to the railway station on an electric truck and that maker who uses a gasoline truck. The government apparently fails to see this and will tax gasoline but not electricity.

There is no difference between the farmer who uses the small electric motor to pump his water, and the other farmer who uses a small gasoline engine for this work.

There is no difference between the farmer who uses a steam engine to thrash his grain and the other farmer who uses a gasoline engine, excepting that the government would tax the use of gasoline for this purpose and let the use of steam go free.

The electric trolley car would go untaxed, the steam railroad train would go untaxed, and yet the up-to-date gasoline railway car and the combination gasoline and electric railway car, which is proving a paying investment to scores of our railroads would be taxed. The gasoline launch would be taxed but the steam launch let go untaxed.

Many Misconceptions

It is to be granted that additional revenue has to be raised but this should not be raised in the form of class legislation of a type that is highly discriminatory. It has been apparently conceived that the automobile industry is a fabulously wealthy industry because excessively large dividends have been declared by three or four companies. It is true that perhaps six or seven companies have declared excessive dividends, but while this is true there are scores of other companies that barely exist. The entire industry should not be estimated by the success of a few companies, but rather on the success of the masses. We have had 400 failures in the industry. These are lost sight of in the success of a few.

Further, it has been argued that practically one State, namely, Michigan, produces all of the cars in the country. This is far from the truth. The automobile industry is not local to Michigan. A horsepower tax will not mean saddling a load on Michigan, rather it will be a tax distributed over all the States, as the buyer will have to pay it.

Cars Overtaxed Already

Vehicles have as much right to pay special taxes for revenue purposes as any other departments of our country, but why discriminate among classes of vehicles? If it is right to tax one type of vehicle then it is equally right to tax all types. The motor vehicle is no longer a vehicle of pleasure or luxury. It is a vehicle of necessity. It is the greatest asset in the present war. It is one of the greatest influences of the present century. Already in many States the motor vehicle is taxed three times: First, there is the State registration; second, comes personal property tax, and third, there is the wheel tax in a few States. To these three would be added two others by the present suggestion, namely, a tax on all gasoline, and also a tax on horsepower.

N. A. C. C. to Fight Measure

Already the National Automobile Chamber of Commerce has been collecting valuable information to present to the government in opposition to this gasoline and horsepower tax. These arguments will be presented in Washington at the proper time. The chamber will endeavor to show how the automobile industry is a national industry and not one local to any State.

Already dealers' organizations in different cities are taking up the fight. The Boston Automobile Dealers' Association has taken the ground that if a horsepower tax were placed on automobiles it would be largely saddled on the dealers who would have a difficult task in passing it along to the consumer. The Boston dealers sent a commission to Washington on the matter a year ago and they are at present ready to send another delegation to the capital when the occasion demands it.

Gretzer Avery Advertising Mgr.

LOUISVILLE, KY., Nov. 27—T. N. Gretzer, former advertising manager of the Hart-Parr Co., Charles City, Iowa, has been appointed advertising manager of B. F. Avery & Sons, tractor manufacturers in Louisville, Ky.

Magneto Makers Settle Suits

Bosch and Splitdorf Companies Effect Amicable Termination to Patent Litigation

NEW YORK CITY, Nov. 30—Magneto patent suits instituted about two years ago between the Bosch Magneto Co. and the Splitdorf Electrical Co. have been amicably terminated. In two suits by Bosch against F. A. Baker, who sold Splitdorf-equipped motorcycles, Splitdorf recognizes the validity of the Bosch patents. In one suit by Splitdorf against Bosch, Bosch recognizes the validity of the Splitdorf patent. It is stated that this ending of the litigation will have no great effect, because both companies some time ago discontinued the use of the alleged infringing constructions.

One suit, Bosch vs. Baker (Splitdorf), was upon Bosch patent No. 974,967, covering magneto ignition in V-type gasoline engines.

The other suit, Bosch vs. Baker (Splitdorf), was upon the Gottlieb Honold patent, No. 900,542, covering a construction which gave a prolonged high-tension spark with a high-tension magneto.

The suit, Splitdorf vs. Bosch, was upon patent No. 1,074,416, covering a means for changing the polarity of the armature to coincide with the polarity of an external current during the time that the primary winding on the armature is coupled with the external source of current. All three suits were in the United States district court in this city.

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Franklin Travels 1046 Miles on 1 Gal. of Oil

NEW YORK CITY, Dec. 1—Reports of a road test on a Franklin car to determine gasoline and oil consumption have been issued by the Technical Committee of the Automobile Club of America. The test was carried out over the roads between New York and Chicago, the car traveling by way of Albany, Utica, Syracuse, Buffalo, Erie, Cleveland and Kendallville. The mileage was checked on the odometer of the car and on accepted route maps.

All sorts of roads and weather were encountered along the way, sunshine, rain and snow being parts of the program. The total net running time was 60 hr. and 18 min. and the elapsed time 67 hr. and 37 min. The running average was 18.9 m.p.h.

During the trip 68.3 gal. of gasoline were consumed making an average of 16.7 miles per gallon. The gravity of the gasoline varied from 58 to 63 deg. Baume. The total oil consumption was 1.09 gal. or 1046 miles per gallon. The oil used is known as Quaker State medium made by Phinney Bros. Oil Co., Oil City, Pa. The car was fitted with a five-passenger sedan body and was stock in every way. All-weather non-skid tires were used and gasoline was fed by the Stewart vacuum feed system.

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Fostoria Light Car Takes Over Storm Buggy Co.

FOSTORIA, OHIO, Nov. 26—The Fostoria Light Car Co., recently incorporated with a capital of $500,000, has taken over the holdings of the Fostoria Storm Buggy Co., capitalized at $100,000.

The company will occupy the entire two-story brick building on South Poplar Street which has been occupied jointly by the two companies and has a 300-ft. frontage on South Poplar Street. The building contains 34,000 sq. ft. of floorspace.

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U. S. Has New Anti-Skid

NEW YORK CITY, Nov. 30—The U. S. Tire Co. has developed a new non-skid tire called the Union tread which will sell at a price approximating that of the plain tread casing.

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Johnson Is Klaxon Factory Equipment Manager

NEWARK, N. J., Nov. 30—Charles Johnson, who has been special representative of the Lovell-McConnell Mfg. Co., in Detroit, has been made factory equipment manager for the entire United States. All factory equipment business will hereafter be transacted through the Detroit branch of the company.

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Griffin a Maxwell Representative

LOS ANGELES, CAL., Nov. 24—J. G. Griffin, formerly a newspaperman of this city, has been appointed special Western factory representative of the Maxwell with headquarters in San Francisco. Mr. Griffin is to cover the entire territory under T. J. Toner, national sales director for the Maxwell in the West. This territory includes Washington, Oregon, California, Utah, Montana, Idaho, Arizona and Nevada.

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Jaffess' Harrison Assets on Block

HARRISON, N. J., Dec. 1—All the assets and effects of Leon Jaffess in this city, a dealer in second-hand rubber, tires, tubes, etc., at 400 North Fifth Street, will be sold at auction on Dec. 10 by the receiver, L. G. Beekman. Mr. Jaffess, who had stores in New York City, Detroit, and Cleveland and a plant in Plainfield, made an assignment for the benefit of creditors last September.

Gasoline Prices Keep Rising

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Selling at 24.5 Cents a Gal. in New Mexico—Further Rises Predicted

NEW YORK CITY, Nov. 30—Gasoline prices are continuing their upward movement with another 1-cent rise, effective in all sections of the country. The latest advance is that of Louisville where the tank wagon price has been raised 2½ cents a gallon to 17 cents. The price to garages in large lots is 16 cents.

Advance in Indiana

Independent oil interests state that the Standard Oil Co. of Indiana will advance gasoline 1 cent this week to a basis of 15½ cents a gallon, tank wagon, and refined oil ½-cent to 7½ cents a gallon.

Higher in Milwaukee

Milwaukee jobbers have advanced the price 1 cent, making an increase of 2 cents within 30 days. The withdrawal of quotations for lots of 100 gal. or more, has had the effect of increasing the price in large lots 3 cents since Oct. 25. In this city, the prices range from 14.6 cents a gallon for the 59 deg. specific gravity, to 22 cents a gallon for the 70 deg. specific gravity.

Highest in New Mexico

In Arizona and New Mexico the tank wagon price at certain points is as follows: Tucson, Ariz., 21.5 cents; Douglas, Ariz., 21 cents, and Santa Fe, N. M., 24.5 cents. Incidentally these prices are about the highest in the country.

21 Cents in New York

Automobile owners in New York City are now paying 21 cents a gallon for their gasoline. The tank wagon price is 19 cents. In New Jersey, the prices range from 19 to 21 cents a gallon.

Fight in St. Louis

The prices in St. Louis vary on account of the fight between the S. O. and the Independents. Last week the Standard Oil Co. raised the price 1 cent to 13.9 cents. The Independents, determined to maintain their 1-cent lead over the Standard, in turn raised their price to 15 cents at filling stations. Independents in that city declare the price of gasoline in Missouri within the next few months and perhaps only weeks will be brought back to where it was before the so-called war between the Standard and the Independents began. A Federal investigation into every branch of the oil industry in Missouri and several States is now in progress.

Louisville owners, who have been buy-

ing their gasoline in 1000-gal. lots, receiving a book of tickets in which each ticket called for a certain number of gallons, are now in a quandary as to whether to buy their books at the now inflated prices or to wait for a slump. Prices took another jump last Saturday when an advance of 2½ cents brought the price up to 20 cents a gallon. The cost per gallon as late as the middle of August was 11 cents.

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International India Rubber Corp. Formed with $1,000,000 Capital

SOUTH BEND, IND., Nov. 26—The International India Rubber Corp., this city, with a capital of $1,000,000, has been granted a charter to manufacture automobile tires. P. E. Studebaker, son of the late Henry Studebaker, is to be president; E. H. Schwab, manufacturer of Bethlehem spark plugs, is to be vice-president; G. W. Odell, formerly with the Toledo Ford Tire Co., Findlay, Ohio, is to be secretary and general manager; J. R. Nobile will be treasurer.

The company has opened temporary offices in the Union Trust building and has taken an option on real estate in South Bend for a factory site, it being the intention of the management to erect its own buildings as needed from time to time.

The $1,000,000 stock is divided equally between the common and the preferred, there being $500,000 of each. The preferred stock is 7 per cent.

The company, aside from the fact that it is to produce tires, has a unique and original selling plan. A part of the 7 per cent cumulative and protected preferred stock will be distributed at par for the purpose of establishing selling branches. These selling branches will be widely distributed and will be devoted to advertising and selling the product. It is the intention of the company to have, by the time its buildings are erected, and its plant is equipped, at least 500 branch establishments.

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Detroit S. A. E. Banquet Dec. 4

DETROIT, MICH., Nov. 29—Chairman George W. Dunham of the Detroit Section of the Society of Automobile Engineers, is sending out invitations to the executive heads, manufacturers and factory managers of all the automobile manufacturers in the United States, to be present at the banquet which the Detroit section will give Dec. 4, and which marks the climax of this year's activities of the society. In addition to the president and council of the Society of Automobile Engineers, members from the New York, Indianapolis, Chicago and Cleveland sections are expected to be present.

The principal speaker at the banquet will be Isaac F. Marcosson, whose subject will be "The War and Business."

$845 Elgin Six in Field

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New Chicago Product Has 3 by 4¼-In. Motor—Two Body Styles

CHICAGO, ILL., Nov. 29—In the Elgin Motor Car Corp., Chicago has its second automobile factory, and the product—the Elgin six at $845—will be at the show here in January. Organized last spring, the Elgin Motor Car Corp., with a capital stock of $1,000,000, one-half of which is subscribed for or pledges made guaranteeing subscription, has brought its plans to a focus in the new six-cylinder car that is about to be placed on the market.

The building that will be used is adjacent to the concern's site in Argo, a suburb of Chicago, having immediate access to two belt lines that connect with all railroads in the city, which will make shipping facilities all that is to be desired.

Personnel of the Company

The official personnel of the corporation includes Frederick L. Brown, of Crandall & Brown, Chicago lumber firm, president; C. S. Rieman, formerly vice-president and general manager of the Service Motor Car Co., vice-president; W. G. Knoedler, president of the Argo State Bank, treasurer; and J. Jerome Kluge, secretary. The directorate includes the president, vice-president and treasurer, together with David Schnitzler, branch manager of the Mutual Life Insurance Co. of New York; J. M. Snitzler, president and treasurer of the Snitzler Advertising Co., Chicago, and Dr. A. L. Tull, Chicago. John A. Schroeder, formerly with the Hyatt Roller Bearing Co. is production manager and Reed & Glaser, Indianapolis, Ind., consulting engineers.

The production plans call for an output of 1000 cars by Aug. 1, 1916, delivery to begin in January and proceed on a graduated scale. It is to be strictly an assembled car.

The power plant embraces a six-cylinder Falls motor with overhead valves, and cylinders having a 3-in. bore and a 4¼-in. stroke, block cast. It is rated at between 30 and 35 hp. The motor has three-point suspension and a combination of force feed and splash is used. Cooling is by thermo-syphon. The ignition distributer and switch is of the Delco make and the starting and lighting is by the Dyneto system.

Two body styles are offered on the one chassis, which measures 114 in. The touring model will accommodate five passengers, and is of the yacht-line design with concealed hinges and flush type door locks. Upholstery is in long grain black leather, with deep backs and slanting cushions. It is equipped with foot and robe rails and is finished in black.

The roadster will be of the clover leaf seating arrangement and aside from the color the finish of this body does not differ from the touring model. The color of the roadster will be Elgin gray with yellow running gear.

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No Change in General Vehicle Co. Management

NEW YORK CITY, Nov. 26—P. D. Wagoner, president of the General Vehicle Co. Inc., Long Island City, N. Y., which, with the Peerless Motor Car Co., Cleveland, Ohio, recently became a subsidiary of the Peerless Truck & Motor Corp., states that the new interests will not in any way change the company's operating management or affect its relations with customers. There will also be no change in the company's manufacture of electrical apparatus and it will continue to devote its energies to the development of the electric vehicle business. The manufacture and marketing of the Mercedes truck will also be continued. The 5-6-ton size is now in production and arrangements are being made for the other sizes to go into production shortly. The company is also planning to actively engage in the manufacture and sale of the Mercedes aeroplane motor.

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3500 Beaver Motors for Sun

MILWAUKEE, WIS., Nov. 26—The Beaver Mfg. Co., this city, has received an order to build 3500 special motors for the Sun light six to be put on the market Jan. 1 by the Sun Motor Car Co.

R. C. Hoffman, designer of the motor, and engineer of the Sun company, stated, "We have incorporated in our motor the latest developments and have obtained what may really be termed the American type high-speed motor.

"For instance, we have eliminated the push rods and the motor can easily run up to 3000 revolutions."

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Several Additions in Detroit

DETROIT, MICH., Nov. 29—While nothing striking has been announced in the way of new plants or additions by local manufacturers during the last few days, reports from building contractors show that quite a number of minor contracts have been awarded. The Cadillac Motor Car Co. is to have a two-story steel frame addition to its plant on Cass Avenue, while a small addition to connect two buildings at its Fort Street plant will be put up there. A one-story frame addition, as a storage building, is to be put up for the Columbia Casting Co., on

Summit Avenue. The Detroit Steel Products Co., has contracted for a one-story steel frame storage building. Bids for an addition to the plant of the C. M. Hall Lamp Co., are being received. A one-story brick addition will be erected for the Detroit Steel Castings Co. The total expenditure for all these additions will be less then $10,000.

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2-Ton Acme Truck, $2000

CADILLAC, MICH., Nov. 26—The Cadillac Auto Truck Co., this city has brought out under the name of Acme a 2-ton truck, which is to be the first of a complete line. This machine uses a type C 4⅛ by 5¼ four-cylinder Continental motor developing 40 brake hp. From the motor the drive is taken through a Warner multiple dry disk clutch and three-speed selective gearset used with heat-treated alloy steel gears of 1-in. face, a two-piece driveshaft with three universals supported in the center on self-aligning ball bearings, giving straight line drive to the Timken-David Brown worm gear rear axle. No radius rods or torque members are used, the top leaf of the springs being special alloy steel to take both torque and thrust. Service and emergency brakes are internal expanding and the Pierce governor is locked and sealed, limiting speed to 1200 r.p.m., or 17 m.p.h. The wheelbase is 148 in. and tread 58½. The chassis is 217½ in. over all and the loading space is 128 in. Front tires are 36 by 4 and rear 36 by 6, dual tires being furnished when desired. Some features of equipment are: Detroit springs, Gemmer steering gear, Eisemann magneto, Rayfield carbureter and Long truck radiator. The wheels are of artillery type.

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Prudden to Double Plant

LANSING, MICH., Nov. 26—It is reported in the city that the W. K. Prudden Co., which is one of the biggest automobile wheel manufacturers in the country will double its plant, and possibly erect an entirely new one. This concern's business has increased steadily during the past twelve months, and it is a necessity with it to enlarge at once as otherwise it will not be possible to take care of the increased business.

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K. C. Tire To Open Feb. 1

KANSAS CITY, MO., Nov. 24—The Kansas City Rubber Tire Corp., which last week purchased the old Riverside Iron Works plant in Kansas City, Mo., announced this week that it will start its plant working by Feb. 1. Present plans contemplate giving employment to 500 persons, including expert tire-makers who will come from the East.

Packard Motors For Aeroplanes

Twin-Six Type Found Most Suitable After Experiment—For U. S. Defense

DETROIT, MICH., Nov. 26—For about a year, after the European war had been going on for some time and the value of the aeroplane to the armies had been amply demonstrated, Henry B. Joy, president of the Packard Motor Car Co., thought that the time will come when the United States government will need a fleet of aeroplanes.

Tests to Continue

Experimental work was started quietly by the engineers of the Packard company, with Packard motors, and after much testing it was found by them that the twin-six motor was best adapted for aeroplane purposes. Now it is announced by President Joy that the Packard company will build such motors. The tests will continue, however, and full particulars as to the motor will not be given for some time. It might be said, however, that the Packard aeroplane motor will be in general principle similar to the twin-six passenger car motor.

To Help Government

The decision to build motors for aeroplanes was due principally to President Joy, although all the members of the board of directors of the company, when sounded on the subject, were strongly in favor, because the principal object in making such motors is that of helping the United States government in preparing for a fleet of aeroplanes.

In speaking on the subject, President Joy said in part as follows: "It is probably a little out of the ordinary for a corporation to go out of its way to produce such military devices as aeroplane motors, because the demand for them will probably be very uncertain. Yet our directors feel that it is a part of the very important duty of manufacturers in this country to mobilize their facilities into such form that they might be available in time of need. We are inclined to feel that our government is going to find important need of co-operating in the development of what would be the serious wants of our country in time of military trouble, in case such an unfortunate condition should come to pass.

A Manufacturer's Duty

"I feel that I have understated the proposition as to the views which our directors hold of the duties of manufacturers in this country to work in co-operation with the government officials so that we may be ready for any emergency. Our company feels that it is its duty to carry on this work toward the condition of military preparedness which all our directors thoroughly believe is the important necessity of the day.

"We are engaged in seeking to develop aeroplane motors, in the neighborhood of 100 and 200 hp., for light scout aeroplanes and heavier duty aeroplanes."

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Olds Distributors at Factory

LANSING, MICH., Nov. 27—Distributors for the Oldsmobile were guests of the Olds Motor Works during several days at the plant. Many came with their service managers. As in the instance of the branch managers' and road men's convention, prominent parts makers or their representatives came to give talks to the men about parts or equipment.

During the two days the convention lasted the visitors were addressed by Sales Manager J. V. Hall, who made the statement that once the point of saturation is reached in the automobile market, and the supply of cars exceeds the demand, the success of the retail dealer as well as the manufacturer, will depend upon his ability as a merchant. Assistant sales manager N. W. Barton spoke of improved methods in marketing automobiles. Chief Engineer F. Sergardi gave a detailed talk about the Oldsmobile chassis and engine and explained the numerous mechanical improvements adopted within the past year. Advertising manager C. V. McGuire talked about "atmosphere" in advertising. Service manager F. C. Hill talked about the Oldsmobile service. W. H. Mooney, installation engineer of the Dayton Engineering Laboratories, builders of the Delco starting and lighting system, spoke on the subject of multi-cylinder ignition. H. W. Farr, representing the Johnson Carbureter Co., gave a lecture on carburetion.

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Builds 2½-Ton Truck

DULUTH, MINN., Nov. 24—Hugh Miscampbell, owning a machine shop at 304 South First Street, has begun manufacture of a 2½-ton motor truck. It will sell for $2,700. The truck is yet unnamed.

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Ware Truck Plant Under Way

ST. PAUL, MINN., Nov. 24—Construction has begun for the new factory of the Four Wheel Drive Co. of the Twin Cities. The building is to be two stories with basement, foundation being heavy enough for a total of four stories. The present contract is for $51,000. The building will face 200 ft. on University at Pelham Street, two blocks from the new Overland plant, St. Paul. It will be ready by March 1, 1916, for the manufacture of Ware motor trucks.

Two Land Deals in Cleveland

Baker R. & L. To Build New Plant—Rollin White Plans Tractor Factory

CLEVELAND, OHIO, Nov. 30—Two important purchases of land have been made during the past week in this city by local automobile makers. One tract of land at Euclid Avenue and Lamb Avenue, Euclid, consisting of 38.67 acres has been purchased by Rollin H. White, who will erect at once a $200,000 factory in which he will manufacture tractors. The second tract of land, consisting of approximately 104 acres near the National Carbon works at Madison Avenue and West 117th Street, has been bought by the Baker-Rauch & Lang Co.

The White property in Euclid is to be improved with factory buildings which are to be erected in sections. The first section, as was stated, will cost $200,000. The remainder of the buildings are to be erected as rapidly as wanted. All are to be occupied by a company headed by Mr. White for the manufacture of a farm tractor and other power farm machinery invented and patented by Mr. White.

The Baker-Rauch & Lang Co. plans to erect, it is said, a modern factory building, so arranged that the cost of production will be greatly reduced. The American Ball Bearing Co., which now occupies a plant adjoining the Baker factory, will either move to the new site or occupy the Baker plant when vacated, it was reported.

Overland Factory Branch in K. C.

KANSAS CITY, MO., Nov. 26—The Willys-Overland Motor Co. has bought the four-story building occupied by its distributing agency at Twenty-first Street and Grand Avenue and 75 ft. adjoining for the purpose of erecting a factory branch for the Southwest. The company plans to add two stories to the present building and to continue the six-story structure over the entire area. The new factory branch will cost in the neighborhood of $500,000.

Wisconsin Truck Move Completed

SHEBOYGAN, WIS., Nov. 26—The incorporation of the Myers Machine Co. of Sheboygan, Wis., with a capital stock of $50,000, is the final step in the removal of the Wisconsin Motor Truck Co. of Baraboo, Wis., to Sheboygan, Wis. The Baraboo concern was established about three years ago by Louis P. Helm and some time ago Mr. Helm opened negotiations with several of the larger cities of Wisconsin for removal. George P. Myers, who has been operating a large machine shop and works at Sheboygan, Wis., for several years, became interested and upon the conclusion of negotiations, the incorporation of the Myers Machine Co. followed. A large addition will be erected at once to accommodate the Baraboo works. The new building will be 75 by 75 ft., two-story and basement. The Myers company will continue to manufacture woodworking and special machinery under the direction of Mr. Myers, while the motor truck manufacturing department will be conducted by Mr. Helm. Numerous improvements are being made in the design of the truck, chief among which is the adoption of worm drive. Other details of the truck will be made public later.

Sparks-Withington to Add

JACKSON, MICH., Nov. 26—A one-story shipping room, 40 by 90 ft. will be erected by the Sparks-Withington Co., manufacturers of the Sparton warning signals. A two-story building, 40 by 90 ft. is also being erected to be used as washroom and locker room. There are 500 men now on the pay-roll, there being two working shifts. Business is far ahead of last year's and the outlook the best since the company started in business.

Motor Co. for Oshkosh

OSHKOSH, WIS., Nov. 26—The Lake Breeze Motor Co., Chicago, Ill., recently organized to build gasoline engines, has completed arrangements with the Chamber of Commerce of Oshkosh, Wis., to make that city its permanent headquarters. The removal of the shops from Chicago to Oshkosh will be undertaken at once and the new plant be ready for operations about April 15.

Allen Employees Insured

TOLEDO. OHIO, Nov. 27—The Allen Motor Co., Fostoria, Ohio, has insured the life of every employee in its Fostoria and Bucyrus plants.

To Sell Tire Plant

EAST LIVERPOOL, OHIO, Nov. 26—The plant, together with all of the equipment of the Morgan-Marshall Co-operative Rubber Tire Co., in this city, will be offered at public sale by Sheriff Crawford at an early date. It has been appraised at $60,000 and will be sold on the premises.

Makes Sheet Metal Parts

MILWAUKEE, WIS., Nov. 26—The American Brewers & Bottlers' Specialty Co., this city, is manufacturing automobile parts such as fenders, hoods, gasoline tanks, etc.

Ford Plans Eastern Factory

Buys 80-Acre Tract Near Newark—Begin Three More Assembly Plants

NEWARK, N. J., Nov. 26—The Ford Motor Co. has purchased a tract of 80 acres near this city, upon which a large Eastern plant will be established.

Newark has excellent railroad facilities which appealed to Mr. Ford more than anything when he visited that city on an inspection trip last summer. It is stated that Mr. Ford has not been satisfied with the railroad facilities in Detroit and has been desirous of building an Eastern plant where a big savings in freight rates can be made. Added to this the export trade of the company can more easily be taken care of by means of an Eastern plant from which its cars can go direct to the docks.

Begin Work on Three More Ford Assembly Plants

DETROIT, MICH., Nov. 24—Nearly $1,000,000 are being spent by the Ford Motor Co., for the construction of three new assembling plants and service stations, in Milwaukee, Wis., Omaha, Neb., and Oklahoma City, Okla. This brings the number of assembling plants of the company to a total of twenty-eight.

The Milwaukee five-story structure, 120 by 300 ft., will cost $385,000 and will have a production capacity of seventy-five cars a day, with a working force of 400 men. The Omaha plant will be a five-story structure 120 by 284 ft., to cost $375,000. About 400 men are to be employed and seventy-five cars will be assembled a day if necessary. A four-story building, 132 by 275 ft. will be put up in Oklahoma City, having an output capacity of sixty cars a day with a working force of 300 men. The plant will cost $230,000. The Wisconsin plant is to be ready in February, also the one in Omaha. The one in Oklahoma is expected to be opened in May.

In St. Louis the Ford assembling plant is being doubled and in Kansas City the plant is being tripled.

Tire Co. in Eau Claire

EAU CLAIRE, WIS., Nov. 26—The Gillette Safety Tire Co., Chicago, Ill., a corporation capitalized at $1,000,000, has selected the city of Eau Claire, Wis., as the permanent location of its offices and works. The company has purchased, with the aid of the Eau Claire Commercial Club, a site 150 by 300 feet, formerly occupied by the mills of the Northwestern Lumber Co., and will build a modern, fireproof factory at once.

Studebaker Sales $46,851,349

To Sept. 30 Net Earnings Were $7,937,549—Net Profits $7,082,558

NEW YORK CITY, Nov. 30—The income account of the Studebaker Corp. for the nine months ending Sept. 30 shows net sales of $46,851,349, total net earnings of $7,937,549 and net profits carried to surplus of $7,082,558. The total surplus for the twelve months in 1914, after the preferred dividends, was $3,572,916. Earnings for the nine months were equivalent to about 23 per cent on the common, or over 30 per cent for the year, if no increase in net occurred in the December quarter.

The cost of manufacturing and selling and general expenses amounted to $38,857,339 and the reserve for depreciation was $298,471. The net earnings on sales was $7,695,539. Other income amounted to $242,010.

The consolidated balance sheet as of Sept. 30, 1915 follows:

Assets	
Trade name, good-will, patents, etc.	$10,807,276
Plant and property, less reserve for depreciation	12,076,870
Investments in other companies	452,449
Inventories at cost or under	10,493,553
Receivables:	
Accounts	6,034,678
Notes	1,745,626
Less reserves for bad debts and cash discounts	84,065
Cash	7,416,396
Deferred charges to operations	408,948
Total assets	58,351,733
Liabilities	
Preferred stock	$11,758,000
Common stock	27,931,600
Minority stockholders' interest in capital stock of subsidiary company (Studebaker Bros. Co., Northwest)	28,300
5 per cent serial gold notes, dated March 1, 1912, due $400,000 each half-year to March 1, 1922	2,308,500
Accounts payable current	2,835,823
Sundry reserves	1,233,354
Special surplus account	1,636,476
Surplus	10,619,678
Total liabilities	58,351,733

Receiver for Trumbull Car

BRIDGEPORT, CONN., Nov. 26—Upon an application made to Judge William S. Case in the superior court here on Wednesday, Judge Edward K. Nicholson was appointed receiver of the Trumbull Motor Car Co.

The petition to the court was made at the instance of Alexander H. Trumbull, president; Frank S. Trumbull, vice-president; James Trumbull and Robert B. Adams, stockholders.

It was agreed that Judge Nicholson should be receiver, and as there was no opposition he was named. He has been ordered to continue the business until Dec. 10, serving under a bond of $25,000.

Friday, Dec. 3, is the date fixed for a hearing upon the appointment and confirmation of the receiver, and for the naming of appraisers.

The company was organized about two years ago for the purpose of manufacturing small automobiles. The capital stock is $300,000, of which $170,000 has been paid in. There are 3000 shares of the par value of $100 each, of which the petitioners hold a half.

In the petition there is no mention of liabilities, though the assets are fixed at $150,000.

The late Isaac B. Trumbull, who lost his life on the *Lusitania*, was the most active spirit in the enterprise.

Rubber Lower

NEW YORK CITY, Nov. 30—Crude rubber had a sudden drop on Saturday, the decline coming as suddenly and abruptly as the rise a few weeks before. Plantation last week rose to 89½ cents a pound and Fine Up-River Para quoted at 76. Yesterday the Ceylon grade and Para were quoting at 75 and 68 respectively. These figures compare with 60 and 55 cents, the quotations that had prevailed for some time prior to the beginning of the upward movement. The sharp break is attributed to the withdrawal of nearly all substantial buyers.

Few changes occurred in the rest of the markets and prices were fairly steady throughout the week. The metals were especially firm with an extraordinary demand. Electrolytic and Lake coppers held firm at 19¾ cents a pound. There was a heavy demand for lead from domestic consumers with prices steady at $5.25 per 100 lb. Bessemer steel went up $1 a ton on Thursday, closing at $28. Aluminum held steady at 57 cents a pound with a heavy demand. Tin closed at $40 per 100 lb. at a gain of 50 cents.

Daily Market Reports for the Past Week

Material	Tues.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum	.57	.57	.57	.57	.57	...
Antimony	.38	.38	.38	.38	.38	...
Beams and Channels, 100 lb.	1.77	1.77	1.87	1.87	1.87	+.10
Bessemer Steel, ton	27.00	28.00	28.00	28.00	28.00	+1.00
Copper, Elec., lb.	.19¾	.19¾	.19¾	.19¾	.19¾	...
Copper, Lake, lb.	.19¾	.19¾	.19¾	.19¾	.19¾	...
Cottonseed Oil, bbl.	8.12	8.16	8.30	8.22	8.17	+.05
Cyanide Potash, lb.	.23	.23	.23	.23	.23	...
Fish Oil, Menhaden, Brown	.48	.48	.48	.48	.48	...
Gasoline, Auto, bbl.	.19	.19	.19	.19	.19	...
Lard Oil, prime	.92	.92	.92	.92	.92	...
Lead, 100 lb.	5.25	5.25	5.25	5.25	5.25	...
Linseed Oil	.63	.63	.63	.63	.63	...
Open-Hearth Steel, ton	28.00	28.00	28.00	28.00	28.00	...
Petroleum, bbl., Kansas, crude	1.00	1.00	1.00	1.00	1.00	...
Petroleum, bbl., Pennsylvania, crude	2.00	2.00	2.00	2.00	2.00	...
Rapeseed Oil, refined	.85	.85	.85	.85	.85	...
Rubber, Fine Up-River, Para	.76	.73	.70	.69½	.68	—.08
Silk, raw, Italian	...	5.05	...	...	5.10	+.05
Silk, raw, Japan	...	4.95	...	...	4.90	—.05
Sulphuric Acid, 60 Baume	1.00	1.00	1.00	1.00	1.00	...
Tin, 100 lb.	39.50	39.50	40.00	40.00	40.00	+.50
Tire Scrap	.05	.05¼	.05¼	.05¼	.05¼	+.00¼

Consolidated Capital Now $500,000

DETROIT, MICH., Nov. 30—The Consolidated Car Co., which was organized in January and took over the business of the old Abbott-Detroit company, has increased its capital stock to $500,000. Its original capital was $100,000 which was later increased to $250,000. The company contemplates increasing its manufacturing facilities.

Change in Bell Personnel

YORK, PA., Nov. 27—At a meeting of the board of directors of the Bell Motor Car Co. on Nov. 19, a slight change was made in the personnel of the officers of the company which is now as follows: H. M. Stauffer, president and business manager; H. W. Posey, vice-president and general manager; B. F. Posey, secretary and treasurer; E. T. Gilliard, designer and chief engineer; H. W. Conrad, assistant general manager and sales manager.

Kelly-Springfield Reduces Common Par Value to $25

NEW YORK CITY, Dec. 1—At a special meeting of the stockholders of the Kelly-Springfield Tire Co., in Jersey City, the proposed reduction in the par value of the common shares from $100 to $25 was authorized. Common stockholders were also given the voting privilege of one vote for each share of a par value of $25, while the preferred stockholders, to equalize the voting power of both classes of stock were given the right of four votes for each share of preferred stock held by them.

Receiver for Dreadnaught Tire

BALTIMORE, MD., Nov. 27—Eli Frank has been appointed receiver for the Dreadnaught Tire Co., this city upon application by the Manhassett Mills Co., New York, a creditor to the extent of $20,000. The Dreadnaught company consented to the appointment. The attorney for the company says the assets are about $200,000 and the liabilities about $150,000 and the appointment of a receiver is only for the purpose of refinancing the concern.

Kennedy Represents Hammond Steel

DETROIT, MICH., Nov. 30—Don F. Kennedy, manufacturer's agent of Detroit, has arranged to take over the sales in the Western part of the country of the Hammond Steel & Forging Co., Inc.,

Syracuse, N. Y., manufacturer of hammered tool steel bars, die blocks and special forgings, which arrangement will become effective Dec. 1. The present office of the company in the Dime Bank Bldg. here, will be discontinued. Mr. Kennedy also handles the accounts of the T. R. Almond Mfg. Co., and the Sawyer Tool Mfg. Co., Ashburnham, Mass.

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Simplex Capital Now $5,000,000

WILMINGTON, DEL., Nov. 25—The Simplex Automobile Co. has filed a certificate to corporate amendment in Delaware to increase its capital stock from $1,500,000 to $5,000,000.

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Gerlinger Co. Doubles Capital

SEATTLE, WASH., Nov. 26—The Gerlinger Motor Car Co., of Seattle and Portland, manufacturer of the Gersix truck, has increased its capital stock from $50,000 to $100,000, of which $51,000 already is paid in.

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Dividends Declared

Yale & Towne Mfg. Co. quarterly of 1¾ per cent and an extra dividend of 5 per cent. Regular payable Jan. 3 to holders of record Dec. 22, and extra payable on Dec. 23 to holders of record Dec. 8.

Packard Motor Car Co. quarterly of 1¾ per cent on preferred, payable Dec. 15, to holders of record Nov. 30.

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Sta-Tite Now Keys Piston Ring Co.

ST. LOUIS, MO., Nov. 26—The Sta-Tite Packing Ring Co. has changed its name to the Keys Piston Ring Co., and the name of its product to the K-P ring.

Automobile Stocks Are Dull

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General Motors Soars to 463 and Paige Reaches High Mark of 700

NEW YORK CITY, Dec. 1—Automobile stocks were dull but firm last week. A majority of the issues remained unchanged. However, there were a few, such as General Motors, Paige-Detroit, Maxwell, Willys-Overland, Studebaker and Packard, which showed substantial rises.

General Motors soared to a new high price yesterday when it sold for 463, almost 400 points higher than the quotation a year ago. At the present prices trading in this stock is a luxury few can indulge in. Odd lot houses refuse to take orders in the issue at all except for cash. Paige-Detroit stock, which showed a 110-point rise last week kept up its skyward movement by reaching the 700 mark with a 40-point gain. Packard common, after a 1-point decline last week, went up 10 points, closing on Saturday at 140. Maxwell common rose 2½ points. The two preferred were dull during the first part of last week but picked up at the closing on Saturday. Willys-Overland closed at 240 yesterday, nearly 170 points higher than last year's quotation. On Saturday this stock was quoting at 230. Studebaker showed a gain of 3 points. This stock fluctuated throughout the week, hovering around the 154-point mark.

General Motors and Paige featured the Detroit active stocks. The first stock gained 35 closing at 440 while the second reached the 700 mark with a 25-point gain. There were a few 1-point declines and most of the gains ranged from 1 to 5 points.

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Chase Names Directors

SYRACUSE, N. Y., Nov. 16—Close on the heels of the recent meeting at the Chase Motor Truck Co.'s plant here, comes the announcement of the election of the directors to serve for the next year. They are as follows: A. M. Chase, president and general manager of the company; Col. A. C. Chase; L. O. Bucklin, president Little Falls National Bank, Little Falls, N. Y.; E. C. Witherby, general manager, Semet-Solvay Co., Syracuse, N. Y. and H. P. Bellinger, general manager Caustic Dept., Solvay Process Co., Solvay, N. Y.

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Poor Resigns from S. K. F.

NEW YORK CITY, Nov. 16—F. H. Poor, who has been general manager for the S. K. F. Ball Bearing Co. of New York since 1909, has resigned that position and opened an office at 30 Church Street. This resignation, however, is merely a formal one, as the new S. K. F. Ball Bearing Co. of Connecticut is planning to absorb the old New York importing company, when it is expected that Mr. Poor will take another contract with the S. K. F. interests.

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Hupp Co. Chartered in Virginia

RICHMOND, VA., Nov. 24—The Hupp Motor Car Corp. was chartered to-day under the laws of this State, with an authorized capital of $8,000,000. A. D. Christian of Richmond, is president, and H. H. Chalkley of Richmond, secretary.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Ajax-Grieb Rubber Co., com	250	..	350	450	..
Ajax-Grieb Rubber Co., pfd	100	..	101	110	..
Aluminum Castings, pfd	..	..	..	..	..
J. I. Case, preferred	..	..	88	90	..
Chalmers Motor Company, com	..	97	145	160	..
Chalmers Motor Company, pfd	..	93½	102	106	..
Chevrolet Motor Co	..	..	..	126	..
Electric Storage Battery Co	..	..	65⅞	66⅛	..
Firestone Tire & Rubber Co., com	320	325	700	725	..
Firestone Tire & Rubber Co., pfd	105	111	112	..	..
General Motors Company, com	67	69	455	458	+36
General Motors Company, pfd	84	87	113	115	—1½
B. F. Goodrich Company, com	23	25	71¼	71¾	+1¼
B. F. Goodrich Company, pfd	88	..	111	113	..
Goodyear Tire & Rubber Co., com	175	185	338	342	..
Goodyear Tire & Rubber Co., pfd	97	100	111	113	..
Gray & Davis, Inc., pfd	..	..	..	..	..
International Motor Co., com	..	..	33	38	—2
International Motor Co., pfd	..	..	50	58	—5
†Kelly-Springfield Tire Co., com	61	64	300	305	+3
Kelly-Springfield Tire Co., 1st pfd	75	78	74	76	—1
Kelly-Springfield Tire Co., 2nd pfd	90	95	93	96	..
Maxwell Motor Company, com	14½	14¾	75⅛	75¾	+2½
Maxwell Motor Company, 1st pfd	43	45	99¼	99½	+¼
Maxwell Motor Company, 2nd pfd	17	19	56⅝	57	+⅜
Miller Rubber Company, com	..	..	248	250	..
Miller Rubber Company, pfd	..	..	109	111	—½
New Departure Mfg. Co., com	..	..	..	..	..
New Departure Mfg. Co., pfd	..	..	..	..	..
Packard Motor Car Company, com	..	100	140	145	+10
Packard Motor Car Company, pfd	89	..	100	104	+1
Paige-Detroit Motor Car	..	..	700	..	+40
Peerless Motor Car Co	..	..	32	50	—4
Portage Rubber Co., com	..	..	65	75	..
Portage Rubber Co., pfd	..	..	98	100	..
Regal Motor Co., pfd	..	..	17	24	..
*Reo Motor Truck Company	10½	11½	23	24	+2
*Reo Motor Car Company	21½	22½	54	54½	..
Splitdorf Electric Co., pfd	..	..	..	..	..
Stewart-Warner Speed. Corp., com	47	48	89½	90½	+1½
Stewart-Warner Speed. Corp., pfd	97	99	107	..	+1
Studebaker Corporation, com	34	36	154	155	+3
Studebaker Corporation, pfd	85	..	112	113	+1
Swinehart Tire & Rubber Co	..	..	..	90	..
Texas Company	..	..	212¼	215	..
U. S. Rubber Co., com	44	45	53½	54½	+½
U. S. Rubber Co., pfd	94	96	107	108	..
Vacuum Oil Company	202	..	228	231	..
White Company, preferred	..	..	110	..	..
Willys-Overland Co., com	76	80	230	240	+2
Willys-Overland Co., pfd	88	92	113	114	..

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Wk's Ch'ge
Chalmers Motor Co., com	..	97	..	161	—1
Chalmers Motor Co., pfd	..	93½	101	104	..
Continental Motor Co., com	155	180	240	252	—3
Continental Motor Co., pfd	..	75	90½	..	..
General Motors Co., com	68	70	440	460	+35
General Motors Co., pfd	85½	87	114	116	..
Maxwell Motor Co., com	14	15	74	77	..
Maxwell Motor Co., 1st pfd	43	45	98	101	—1
Maxwell Motor Co., 2nd pfd	17	18½	55	57½	+1
Packard Motor Car Co., com	..	100	136	..	+2
Packard Motor Car Co., pfd	89	..	100	..	..
Paige-Detroit Motor Car Co	..	..	700	..	+25
*Reo Motor Car Co	21¾	22½	53½	54½	..
*Reo Motor Truck Co	10½	11⅛	..	24½	+2¼
Studebaker Corp. com	..	..	153	157	+3
Studebaker Corp. pfd	..	..	109	114	..

INACTIVE STOCKS

*Atlas Drop Forge Co	..	25	..	29	..
Ford Motor Co. of Canada	..	500	2000	2750	..
Kelsey Wheel Co	185	..	225	..	+5
*W. K. Prudden Co	..	20½	25¼	25½	+1
Regal Motor Car Co. pfd	..	25	18	24	..

*Par value $10. †1914 quotations are on the old stock.

Race Results Surprise Europeans

Endorse Engineering of Victorious Stutz Cars in Sheepshead Bay Contest

PARIS, Nov. 5—Results of the Sheepshead Bay race, which were not known in Paris until the arrival of THE AUTOMOBILE, have created more surprise than disappointment. Engineers and race drivers have some difficulty in understanding the failure of any European car to finish the race—for Limberg's Delage is thought to be Thomas's reconstructed machine and is no longer looked upon as a French car. No such failure has ever been known in a European race.

While giving full credit to Stutz for a fine performance, all French engineers point out that the motor of the winning cars are built up of many ideas gathered from Peugeot, Delage, Sunbeam and Mercedes racing cars. One racing engineer states that the motor can be described as a Franco-British-German design. "The train of spur gears driving the camshaft is a copy of the Peugeot; the crankshaft is a copy of Peugeot and Delage; the valves, camshaft, and rocker arms are Mercedes; the piston is Sunbeam, and the form of the combustion chamber is Mercedes. It would be childish to deny the value of the motor, for it embodies all the best features of European cars, and the result of the race shows that workmanship was of the best.

All the evidence shows that the European motors, despite their smaller capacity, delivered more power than the American motors. The fastest time for 20 miles was made by Aitkin on Peugeot in 11 min. Resta did 11.02, 11.06, and 11.10. The fastest time made by Stutz was 11.25, while De Palma's Stutz never did better than 11.40. Thus between the best Stutz and the best Peugeot performance there is a difference of 3.08 miles an hour in favor of the Peugeot, although the French car had 22 cu. in. less than the American motor.

Metals Worked Near Limits

"To maintain that the fact of the European cars having run in previous races is a guarantee that they are O.K. is to display a lack of knowledge of racing conditions, at any rate as we know them in Europe. The advantage in this respect was with the Stutz, which had not been raced before, and not with the European cars, all of which had been in one big race and some in several. Metals are worked so near their extreme limits that nobody can say when they will fail. We never run a car in more than two long-distance races, and they are never considered good for more than one season. It is a mistake to suppose that our cars start in a race after having done thousands of miles at highest speed. All the gruelling is taken by a special car, which is not started in the race, or is merely allowed to compete as a runner-up. The real racing cars have taken advantage of any experience gained in the try-out of the test car, but they have not done any more running than is necessary to put them in condition without straining them.

Approach Power Limit

"The statement that we are approaching the limit of power is quite correct. Unless some entirely new type of motor is evolved it is difficult to see how we can get more power and more speed. At the present time we are very close to the highest theoretical pressures, and future races will depend more than ever on good workmanship, details, and scientific preparation. Future races will be keener and the element of chance will be more important. It is worth while considering if it is not advisable to reduce the cubic capacity of racing motors. Just before war broke out Peugeot had on the road a set of racing cars of only 153 cu. in. These averaged 96.5 m.p.h. on the open road.

René Thomas, winner of the 1914 race at Indianapolis, considers that much of the responsibility for the failure of European cars to finish in American races lies with the American drivers. "It has to be noted," says Thomas, "that Resta can win races with Peugeot cars, while no American has proved himself capable of doing so. This seems to point the conclusion that it is not the fault of the car, but of the man who is handling it. American drivers have all the dash and vim that is necessary for winning races, but with a few rare exceptions they do not seem to possess the necessary mechanical ability to get their cars into the best condition for a race, and to keep them in the best condition while the race is on. Cars have been sent over and given to men who have had no previous experience with that particular make. They have no opportunity of getting the right gear ratio for the track on which they are to drive, they do not know at what speed that particular motor ought to be run, and in some cases they run without a revolution counter. It seems to me that American drivers run their cars in far too many races and do not do enough work on them between races. They also appear to expect racing cars to remain in racing condition much longer than is reasonable. Judging from their insuccess in the last two or three races, I should imagine that Resta's Peugeot and De Palma's Mercedes have finished their active career. This is not at all surprising. In Europe we consider that a racing car is good for one season, during which it will run in two long distance events and a few hill climbs and short distance races. After that it is sold to an amateur, or it can be used for sprints on a track.

"On this side the driver lives with the car from the time it is put on the drawing board to the moment it finishes its race. He goes through all the bench tests with the engineers and possesses all data concerning the motor. He knows at what speed it can run and at what speed it ought to be run in a race, and he would no more think of starting without a revolution counter than without water in the radiator. He may spend several weeks, or sometimes months tuning up, trying various gear ratios, carbureter and ignition adjustments, steering column positions, shock absorbers, springs, etc., so that when he starts he knows exactly what he can do and what the car can do in the race.

"Compare this with the system under which a driver is given a car a few days in advance and told to do his best. He may be a first class driver, but he cannot possess the knowledge necessary to get satisfactory results out of the car."

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Autocar Men Hold Sales Conference

NEW YORK CITY, Nov. 30—The Autocar Co.'s sales conference opened on Nov. 26 in this city when ninety representatives of the company attended a dinner. The conference, which was called to map out means and methods of disposing of an increased production of Autocars next season, held a business meeting on the next day. The business of 1915 is said to have been 70 per cent greater than the year previous.

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Schwartzkopf Joins Longuemare

NEW YORK CITY, Nov. 27—E. E. Schwartzkopf, former sales manager of Gray & Davis, Boston, has joined the Longuemare Carbureter Co., New York City, in a sales capacity.

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New Distributor for Gray & Davis

NEW YORK CITY, Nov. 24—The New York branch of Gray & Davis has been discontinued, and the P. J. Durham Co., Inc., has been made distributor of all Gray & Davis products for the Metropolitan district. H. B. Shonts, formerly with the C. T. Silver Co. has gone into the Durham company and will have charge of the sales end of the business.

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100 Dodge Cars in Parade

BOSTON, MASS., Nov. 29—The best parade of motor cars ever witnessed in New England took place this morning when 100 Dodge Bros. cars were driven through the principal streets of the city. It was the first time that so many cars of one make were in a parade here, and

the features brought out by the owners produced some unique designs. The cars started from the salesrooms of the Henshaw Motor Co.

The decorative features were unique. One car was a duplicate of a submarine. Another was decorated with holly and ferns and carried Santa Claus with a lot of toys that he threw to children. Uncle Sam was in another car decorated with flags and bunting.

Others were covered with flowers to represent various seasons. More cars had occupants in military, hunters', football, harvest and opera costumes. One machine towed a buggy bearing signs "Gone, but not forgotten," and "Times have changed."

Three handsome silver cups each worth $100 were awarded to the owners of the best featured cars.

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New Stock for Blood Men

ALLEGAN, MICH., Nov. 20—Stockholders of the Blood Bros. Machine Co. have received a circular from the managers of the company asking them to surrender certificates of stock to Earl W. Delano as trustee and acceptance of new stock for but 17½ per cent of their investment. It means that the balance or 82½ per cent represents a loss to the subscribers of the original stock. It is thought probable that the stockholders will agree to these terms and thus prevent a total loss. It is reported that the company has orders on hand for $80,000 worth of universal joints which will keep the factory busy for the next four or five months. About 100 men are now employed.

Setback for U. S. Cars in France

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Agency Negotiations Affected by 33 to 45% Duty To Be Imposed

PARIS, Nov. 4—Negotiations for the French agencies of American cars have received a setback since it became known that the manufacturers here were assured of getting a substantial protective tariff. It is expected that the tariff is likely to be between 33 and 45 per cent. A meeting of the manufacturers' association a few days ago considered this question, but no decisions were allowed to leak out. As it is obvious that there will be a big demand for certain types of cars as soon as the end of the war is in view, and as it is equally certain that the home manufacturers will not be able to meet that demand for a time, enterprising dealers have been trying to connect with American firms. In view of the threat of a high import duty these negotiations have been suspended.

The only American firm doing a really important business in France is Ford, and if the threatened boycott can be warded off, this make of car should continue to sell well. Overland is making a bid for French custom, and the Buick line is now in the hands of a live agent. There are about a score of other American manufacturers who have, or had, agents in France, but the condition of their stores at present is not a credit to the home factories. All these stores are closed and only the name serves to show where American cars were once sold. Packard keeps open house and is going to unveil the twin-six to Parisians during the present month.

One of the best French dealers, who has financial backing from a millionaire manufacturer, had completed nearly all arrangements for marketing a cheap American car, and had purchased sample cars when news of the proposed duty leaked out. Immediately the backer withdrew all support and the scheme has been dropped. All dealers are now sitting tight awaiting the government move. It may be possible to do some business under a 33 per cent duty, but admittedly the situation will be difficult and only the best propositions handled by the most experienced agents can succeed.

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12 Cars Imported in Sept.

WASHINGTON, D. C., Nov. 30—Twelve cars, valued at $17,198 were imported into the United States in September, 1915. During the nine months ending September, 1915, a total of 171 automobiles, valued at $265,936 were imported. During September, 1914, the imports amounted to sixty-two automobiles valued at $95,170 and during the nine months ending September, 1914, 388 automobiles valued at $293,610 were imported. The table appears herewith.

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Murden Leaves Knickerbocker Truck

NEW YORK CITY, Nov. 26—H. H. Murden general manager and engineer of the Knickerbocker Motor Truck Mfg. Co., this city, has resigned, effective Dec. 31.

Imports of Automobiles and Parts for September and Eight Preceding Months

IMPORTS

	September				Nine Months Ending September			
	1914		1915		1914		1915	
Automobiles ..... No. dut..	62	95,170	12	17,198	388	293,610	171	265,936
Imported from—								
France	7	24,650	7	13,943	143	116,367	52	104,709
Germany	...	.....	...	.....	77	16,556	...	.....
Italy	40	42,496	...	.....	68	74,380	22	28,526
United Kingdom	9	19,537	1	1,605	37	51,033	26	54,811
Other countries	6	8,487	4	1,650	63	35,274	71	77,890
Parts of (except tires) ..... dut..	...	64.573	...	19,883	...	698,624	...	443,456
India rubber, etc, and substitutes for, manufactures of:								
Unmanufactured—								
Balata ..... lbs..free..	315,215	149,758	73,885	29,457	.....	561,048	1,580,668	596,088
Guayula gum ..... lbs..free..	413,474	137,584	415,714	110,530	.....	440,262	4,866,086	1,347,506
Gutta-joolatong ..... lbs..free..	1,268,165	72,492	4,215,627	158,321	.....	777,838	15,759,092	748,869
Gutta-percha ..... lbs..free..	102,453	16,908	545,823	57,450	.....	307,003	1,732,126	203,527
India rubber ..... lbs..free..	14,087,980	6,736,616	19,671,360	9,846,576	.....	53,980,082	160,416,636	79,903,994
Imported from—								
Belgium	467,045	207,755	.....	.....	.....	5,028,504	.....	.....
France	157,822	79,575	.....	.....	.....	843,881	220,032	100,742
Germany	.....	.....	.....	.....	.....	2,336,218	6,987	843
Portugal	221,011	62,955	130,475	42,382	.....	274,058	3,764,580	1,349,497
United Kingdom	7,676,310	4,080,920	5,337,322	3,065,502	.....	22,872,342	69,719,803	37,407,760
Central American States and British Honduras	63,650	31,052	106,994	48,857	.....	186,754	971,942	437,801
Mexico	46,621	24,603	316,027	106,215	.....	247,440	1,429,000	541,455
Brazil	3,789,136	1,421,237	4,581,341	1,647,791	.....	12,239,873	38,172,743	16,165,002
Other South America	229,596	122,984	256.230	114,689	.....	727,275	4,384,007	1,894,496
East Indies	1,342,702	676,104	8,938,271	4,819,260	.....	8,289,899	36,709,657	19,190,659
Other countries	94,087	29,431	4,700	1,880	.....	933,838	5,037,885	2,815,739
India rubber scrap or refuse, fit only for remanufacture ..... lbs..free..	797,245	55,822	1,286,356	98,951	.....	1,190,961	8,807,171	613,164
Total unmanufactured	.....	7,169,180	.....	10,301,285	.....	57,257,194	.....	83,413,148
Antifriction balls and bearings ..... dut..	.....	155,132	.....	96,263	.....	1,276,446	.....	1,073,875

Indianapolis Race 300 Miles

To Cut Purse to $30,000—Entrance Fee To Be $100

INDIANAPOLIS, IND., Nov. 27—At a meeting of the board of directors of the Indianapolis motor speedway, held this week, it was decided to reduce the distance of the May 30 race from 500 to 300 miles and to cut the purse from $50,000 to $30,000, the prize money to be divided in ten parts. The entrance fee will be $100, which will be refunded to the entrant if his car starts. The 1916 race will start at 1:30 p. m.

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Saurer Truck Climbs Mt. Wilson

MOUNT WILSON OBSERVATORY, CAL., Nov. 14—The Mount Wilson toll road, which climbs to 6000 ft. elevation in 9 miles, has been conquered by a Saurer truck, weighing 7300 lb., and built to carry a 6½-ton load, carrying a load of 22,235 lb. from the freight yards of the Carnegie Institute in Pasadena to the summit of Mount Wilson, where the new solar observatory is being constructed.

The 11-ton load consisted of a steel casting which will be used as a section of the pedestal on which a 100-in. telescope of the new observatory will rest.

The weight on the wheels of the truck represented approximately 15 tons. In the yard of the Carnegie Institute at Pasadena the wheels sank 3 in. into the roadway. It required 6 hr. and 20 min. to make the climb from the toll gate at Altadena to the observatory at the summit.

A crowd of a hundred or more spectators witnessed the feat.

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Seventh Edition of Used Car Market Report Out

CHICAGO, ILL., Nov. 30—The seventh edition of the National Used Car Market Report has just been issued by the Chicago Automobile Trade Association. As is evident must be the case with the progress of the industry, this volume is a little larger than the sixth, due to the addition of the 1916 models of many of the cars. In cases where it has not been possible to get authentic figures on 1916 used cars they are not added.

The gasoline car statistics in the sixth edition ended on page 113; in the seventh edition there is a page more. There also are quite a few additions of later models in the electric classification, causing the complete book to end on page 124 instead of 122.

There have been no additions in the list of cars represented. As in the sixth edition, there are 154 gasoline cars and fourteen electrics listed.

Greater co-operation is, however, being secured from associations of dealers. The sixth edition listed twenty-eight as subscribing to the service. In the seventh edition these are added: Ohio State Automobile Association, Cleveland; Iowa Automobile Business Association, Des Moines; Hartford Automobile Dealers Association, Hartford, Conn.; St. Louis Automobile Mfgs. and Dealers Association, St. Louis; Troy Automobile Dealers Association, Troy, N. Y. This makes a total of thirty-three.

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White To Exhibit at Salon

NEW YORK CITY, Nov. 26—The Automobile Salon, which will be held at the Hotel Astor Jan. 3 to 8, will have more exhibitors than any of its predecessors. The representation of American cars will be increased from three to ten or more. Among these will be the White, Simplex, F. R. P., Singer, Owen Magnetic, Brewster, Daniels and Baker. The foreign makes will include the Rolls-Royce, Lancia, Delauney-Belleville and Isotta-Fraschini. The body makers already represented are Holbrook, Healey, Brewster and Bender & Robinson.

All space has been taken at the show which will be purely an invitation affair as last year. It has not as yet been decided whether a banquet will be held during the salon.

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Resta Sails for Europe

NEW YORK CITY, Nov. 26—Dario Resta, hero of the 1915 speedway season, sailed yesterday for England. He will go to France for new parts for his Peugeot. He also plans to buy another car from the Peugeot makers if there is one for sale.

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Kissel Branch for San Diego

SAN DIEGO, CAL., Nov. 24—The Pacific Kissel branch has announced that a branch will be opened in San Diego within the next few days. The company is now fitting out quarters in the San Diego Hotel building where the Kissel and Briscoe will be handled in this territory.

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Car-Buyers' Finance Co. Formed

SPOKANE, WASH., Nov. 24—The Washington Motor Car Finance Co., capitalized for 250,000 shares at $1 each, has been organized in Spokane, Wash. The incorporators are Samuel Glasgow, J. M. Watkins, H. T. Irvine, S. A. Mitchell, and others. J. A. McKee and Charles A. Bradley have been named vice-presidents of the corporation, and S. A. Mitchell, secretary.

The purpose of the corporation is to finance the purchase of automobiles, either by dealers or individuals. Money will be loaned on new cars where from 33 1/3 to 50 per cent of the purchase price is paid by the owner. The company will take a mortgage on the vehicle or purchase it outright and lease it to the buyer, to protect itself for the money advanced.

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Maxwell in Non-Stop Run

LOS ANGELES, CAL., Nov. 23—A stock Maxwell 25 is making an attempt to establish a new world's non-stop record in and around Los Angeles. The car started yesterday and at the end of 36 hr. had covered 797 miles or at an average speed of 22 m.p.h. The car is averaging 26 miles to the gallon of gasoline. The machine is registered with the A. A. A. as a stock model, the sanction number being 888. Earl Cooper, the racing driver is acting as temporary A. A. A. representative in this territory and before leaving for San Francisco yesterday, appointed three official observers who are riding in the car 8 hr. per day. Three employees of the Lord Motor Car Co., Maxwell distributors, are driving.

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All National Show Space Sold

NEW YORK CITY, Dec. 1—No more space is left for car exhibits at either of the National shows, a condition which has never existed before at so early a date. To date only five accessory spaces can be had and these have been applied for.

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Knox Tractor Does Well in Cincinnati Haulage Test

CINCINNATI, OHIO, Nov. 26—This city recently held a test of gasoline tractors for municipal hauling, to test among other things just how much tractors could haul, whether several trailers could be handled conveniently, whether the tractor engine was equal to the task of hauling tonnage up an 8 per cent grade and whether the combined weight of several heavily loaded trailers down that grade could be held back. A Knox tractor was chosen for the experiment and six trailers, the ordinary municipal type dumping wagons, were used.

With the trailers loaded with mud weighing 38,550 lb., the tractor hauled the train up a hill 7000 ft. long with a mean grade of 6.2 per cent and a maximum grade of 8.3 per cent. The surface of the street was granite block.

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Plan Race for Los Angeles

LOS ANGELES, CAL., Nov. 23—Plans are under way for a track race in this city, Dec. 10, in which Barney Oldfield will meet Earl Cooper, and Teddy Tetzlaff is also expected to appear.

Laying Out Chain Camshaft Drives

(*Concluded from page* 1009)

is used for the small wheels, a good gray or piston iron for the large. One set of wheels will wear as long or longer than the chain, and generally the chain is the only part to be replaced. The record mileage, as far as our product goes, with no adjustment, is 32,200 car miles, and I confidently predict a car mileage in the hands of the public, with adjustment for the chain, of from 50,000 to 100,000 car miles, and during this mileage there will be that softer, less harsh feeling than with gearing, and no objectionable noise. Permit me to say that I am here referring to commercial gearing, not special hand fitted, where the cost of the gear drive is probably far in excess of a chain drive, and cannot be produced in the large quantities as commonly manufactured in this country.

Is Chain Makers' Problem

In laying out chain drives for use on the engine, I know I will be serving the manufacturers and users of the car best by advising that the problem be turned over to the chain makers as early as possible, when slight modifications may be made that in no way will impose restrictive limitations on the general design, but will sometimes make the difference between a successful and unsuccessful drive. I also feel that such advice will be little heeded, although I am pleased to say that some manufacturers are co-operating in this way with most satisfactory results.

The information that has appeared from time to time in print has in a general way been correct, and a summary of the recommendations of the various chain makers, as well as Mr. Ricker's observations, will be found in the paper before referred to, which was printed in Part I of the 1912 Proceedings of your Society. I have slightly modified some of the statements therein found, not, please understand, because I think I know more than others in this line of business, but because I think I know the action of our product.

To Prevent Whipping

There is one statement that has been made, and from my experience it is generally accepted as true, viz., that with adjustment whipping can be prevented with the resultant lesser wear and a quiet running drive. This, I believe, is an error, and a most serious one. As far as my experience goes, there is no tension within the capacity of the bearings that will prevent a whip if it is present in the drive. It will reduce the amplitude of the whip, but the destructive force will still exist, and under tension it will never give that smooth running feeling that is always present in a properly designed chain drive. The destructive whip, which occurs when the rate of chain vibration synchronizes with some impulse given off by the engine, must be overcome by changing the critical rate of vibration of the chain, and this is the problem that should be solved when designing, if chain driving is going to be the success warranted by its peculiarly favorable characteristics for this type of drive.

Rules for Design

It is most difficult to give specific instructions for a proper design, and I am not sure that a design for the Morse chain, for instance, will be correct for the other makes, but in general we advise (1) the triangular drive as cheaper and taking less room; (2) shortest centers possible between crank and camshaft; (3) drive from crankshaft to camshaft, and then to accessory shaft, not to camshaft through the accessory shaft; (4) chain wrap should be not less than five teeth; (5) provide adjustment, generally easiest on the accessory shaft; (6) use an odd number of links in the chain, and an odd number of teeth in the crankshaft and accessory sprocket when possible; (7) provide an oil lead from the general oiling system leading to the inside of the chain; (8) design the chain case so that the chain can be made endless, and when on the wheels can be put in place; (9) if adjustment is provided without taking off the gearcase, provide a convenient means of feeling the chain to adjust to the right tension.

Generator Drives

I have made no specific reference to the starter-generator application, as this is an entirely different drive from the cam and accessory shafts, and requires different treatment. The centers almost of necessity are such as to bring the chain within the danger zone of vibration, and so far no weight of chain throughout the full range of elasticity that we have been able to provide has produced what we consider a satisfactory drive. Many of the cars equipped with chains are very noisy at some critical speed, when the strain upon the chain is far in excess of that under which it can be safely run. To correct this trouble necessitates, we believe, the use of a flexible or slipping sprocket wheel, and we have developed such a wheel, which gives a fair promise of success. In the very nature of the case, however, the critical speed or tendency to whip being so markedly different with different engines, we are not entirely satisfied that the device on which we are experimenting will meet all of the conditions, but it has characteristics which permit of a wide range of application, and we are hopeful that it can be made so as to give a quiet and durable drive for this class of work.

Discussion Is Good

IN commenting on his paper, Mr. Morse said that there is a certain point of adjustment in every motor car engine for the tension of the silent chain layouts at which they run the quietest.

Howard Marmon asked how much trouble Mr. Morse is experiencing in getting the co-operation of the car makers in the laying out of chain drives.

Mr. Morse replied that it has not been easy to get any of the automobile engineers to co-operate early enough in the design to permit him to select the center distances he would like, but wherever the engineers have done so, a drive has been furnished that is free of vibration throughout the whole range of engine speed. In his first experience with automobile work, he could get nothing from the engineer of the company that was taking the chain. He considered a chain drive the same as a belt, and thought a belt could be put on to drive anything, notwithstanding some experiments of the Brown & Sharpe Co. that prove there is no period in a belt. This engineer thought the chain simply a makeshift for a belt—merely a belt taking two centers. He took out the gears and put on the chain. Almost always when this was done they got into trouble with the critical center distances. In such cases all kinds of vibrations were set up, and it was necessary to either change the elasticity of the chain by cutting the arc higher, or not so high, or to change the weight or tension of the chain. Such working was decidedly at a disadvantage, because the problem in each case is different and the rate of vibration and period are local to each installation.

Mr. Morse said that he would like to have standard chains that would fit any installation, but the contrary has been true. Chains that seem to be the same to the engineer are radically different in their elasticity. So far as the Morse chain is concerned, they are oftentimes also different in weight and critical speed.

Mr. Morse believes that the solution of the silent chain drive for automobiles has been found, for with the experience the chain makers now have, after going through all sorts of troubles, it seems to him that while sometimes an engine

is built for which the chain makers cannot lay out a drive, if the automobile engineer will permit any chain maker to lay out the drive as he (the chain man) would like to have it, within the chain limitations he knows exist, Mr. Morse believes the chain man can furnish a drive that will be most satisfactory.

Asked as regards chain drives for fours as compared with engines of more cylinders, Mr. Morse said that it is very difficult to make a satisfactory chain drive for a four-cylinder engine. It has to be handled with gloves, and in the Morse chain, for instance, he said there is a maximum range of adjustment of only ⅜ in., without getting into trouble. In the old fours, the crankshafts were often found wanting. The impulses set up by the explosions would produce a vibration which was substantially due to a twisting of the crankshaft a good many degrees when the forward cylinder exploded. When the rear cylinder fired, there was a practically true angular velocity between the cranks, but when the first cylinder fired there was a spring in the shaft which almost always set up a vibration in the chain.

Adjustment Essential

In a chain drive, Mr. Morse explained, it is almost essential that some means of adjustment be provided. You can either move the shaft, or adjust by an idler against the chain, providing that idler is doing work. Mr. Morse does not think you can satisfactorily put an idler against the outside or the inside of a chain unless it does work, for the reason that the chain must run loose. While the chain in the diagram is shown in the conventional way by straight lines between the two wheels, it should at least sag ⅜ to ½ in. on the slack side when it is running, and for that reason no support would be desirable unless it be simply a means of shortening the distance the slack side would be dropped, bringing a node point.

There is a vibration wave that passes through the wheels and comes out on the slack side, but it originates on the tight side. In running, a chain must throw out at a tangent from the wheel, and if it does not when running, it will be noisy, and under no conditions will it operate satisfactorily. If you try to hold it in close to the wheel, it will take a path different from that which it wishes to follow, and it becomes noisy immediately.

Speaking of vertical drives, Mr. Morse said that he would not recommend a vertical chain drive without an adjustment. One prominent car manufacturer is using it without adjustment, therefore Mr. Morse explained that he has no right to say it is absolutely necessary, but he thinks this manufacturer could get a longer mileage out of the chain by using an adjustment, although whether the expense of putting one in would be warranted he leaves to the manufacturer to decide.

W. G. Wall asked as to the amount of wear on the sprockets as compared with the chain, and also if anything has been devised in the way of a balance or indicating device that will indicate to the assembler when putting the chain on that the tension is right.

Wear All on Chain

Mr. Morse said that the wear seems to be almost entirely on the chains, this being especially true of the crankshaft sprocket. He has seen one, he said, after a chain had run 72,000 car miles, and the sprocket was only polished nicely. The camshaft sprocket was also good for many more miles without change. There was probably 1/64 in. wear on the sprocket above referred to, and that was the longest mileage he has had an opportunity to observe.

However, Mr. Morse pointed out, if something goes wrong—if the manufacturer fails in making the chain correctly, or gets in the wrong kind of a link or gets it in backward, as will sometimes happen—the defective point will be a source of steady grinding and will take off every tooth on the sprocket. But under normal conditions, Mr. Morse claimed, there is nothing in the life of the ordinary automobile that will compare with the wear that an ordinary chain transmission will undergo. Tests have been made for over 3000 hr. at a speed of 1700 r.p.m., which would represent hundreds of thousands of car miles, and there is practically no wear shown on the sprockets.

The Proper Tension

In regard to the tension in the chain when assembling, Mr. Morse said that he has tried to get close to the engineers on this, and has recommended putting the chain on with a finger lift of ¼ in. each side of the center. However, this brings in the human element so strongly, and the definition of finger lift is so varied that he says some surer method must be devised, such as using a spring pressure of predetermined amount lifting the chain a certain distance.

Howard Marmon asked whether it is necessary to make provision in the chain housing to allow for breakage.

Mr. Morse said that his company has broken a number of chains to find this out, and they found no damage ever followed so long as the distance from the top of the teeth to the housing is greater than the depth of the chain. The chains have a limited angular motion, and so long as they cannot bend square around, they tend to pile up. If it breaks it will probably be on the tight side, and the sprocket would keep running and the chain pile up in the lowest point of the housing. Mr. Morse suggests a clearance between drive and housing of slightly more than the depth of the chain around the wheels. The housing should allow 1½ in. beyond the chain on the slack side.

Chester Ricker asked if the driving of a camshaft, due to the somewhat intermittent load, tended to periodicity in the chain, and also what the difference was in eights or twelves.

Mr. Morse gave the opinion that it is immaterial whether we drive a camshaft or other device that has fairly uniform resistance, there will always be a vibration set up in a gas engine. He added that with an increasing number of cylinders there is less liability to chain whip, but the chain designer has always to take into consideration that the twelve is a twelve only part of the time. It will miss and skip, and do other things which make it necessary to lay out the drive for bad working conditions as well as good. It must be laid out so that no unexpected condition will set up a critical vibration that will break the chain or destroy the wheels. That periodicity must be avoided if a cylinder is missing continuously. If two are missing, you get poor compression on two cylinders. An indication of whipping is secured on almost any chain drive but a point must be attained where that whip is not destructive. Mr. Morse cited a case where he had installed a 60-hp. drive, but it took 90 hp. to drive it. He later shortened the centers from 41½ to 39½ in. and that slight change remedied the whipping that had consumed 30 hp. and made the chain run noisily.

The point was raised by Mr. Bull that, in his experience, the use of chains tended to increase the volumetric efficiency of an engine, due to the removal of chatter and the flexibility of valve opening and closure.

Mr. Morse said that he confessed to the fact that the opening of the valves when driven by a chain is retarded materially, and accelerated in closing on account of the elasticity and backlash of the chain as compared with gearing. If a high efficiency has been obtained by the use of chains, he thought it due to the fact that the valves open slower and not to other causes named.

He also thought chains will remove valve chatter, and though a gear is more positive in its driving than a chain ever is, for whenever any change of stress comes on the chain, through the fact that the chain is driven by frictional contact with the wheels, there is still a material retardation.

He therefore thought if better results have been obtained by the use of chains, it is one of those happy circumstances that is not due to any inherent characteristic or steadier angular velocity.

Factory Miscellany

Wheel Co. Adds—The Auto Wheel Co., Lansing, Mich., is constructing an addition to its hub house, costing $20,000.

Specialties Co. to Add—The Motor Specialties Co., Muskegon, Mich., has contracted to build two additions which will cost about $6,000.

Hurlburt Truck in New Plant—The Hurlburt Motor Truck Co., New York City, has moved into its new plant at Third Avenue and the Harlem River.

Newark Co. to Build Bodies—The G. S. Jephsen Co., Newark, N. J., will establish a plant on Central Avenue, for the manufacture of automobile bodies.

Brown Carriage Co. to Build—The Brown Carriage and Auto Co., Cleveland, Ohio, has awarded the contract for the construction of a plant, the estimated cost of which is $10,000.

Republic Truck Adding—A one-story addition is being added to the plant of the Republic Motor Truck Co., Alma, Mich., and will add about 50,000 sq. ft. of floor-space to the plant.

To Make Automobile Specialties—The Autocoil Co., Jersey City, N. J., will establish a factory at Provost and Seventh Streets, Jersey City, N. J., for the manufacture of automobile specialties.

Cleveland Co. to Add—The Hydraulic Pressed Steel Co., maker of automobile frames and pressed steel stampings, will construct additions to its factory at 3152 East Sixty-first Street, Cleveland, Ohio, the estimated cost being $50,000.

Ford to Build in Grand Rapids—A committee representing the Association of Commerce of Grand Rapids, has been appointed to visit the Ford Motor Co., Detroit, in view of the proposed erection of a Ford assembling plant in Grand Rapids.

To Make Windshield Cloth—The Central Agency Co., Kansas City, Mo., has purchased the exclusive right to manufacture and sell a compound called Windshield Cloth, which when applied to a windshield absorbs moisture and prevents rain, snow, sleet or mist from sticking to the glass.

Housel & Bair Adds—The firm of Housel & Bair of Williamsport, engaged in the manufacture of automobile clutches, took out a permit this week for the erection of a factory near its present quarters on First Street. The building will be a one-story brick structure and will cost approximately $5,000. The company has enough orders to keep it busy for a year and a half.

Milwaukee Co. Makes Parts—The Wisconsin Machinery & Manufacturing Co., Fifty-first Avenue and Burnham Street, Milwaukee, is devoting most of its shop capacity at this time to the manufacture of parts and devices for the motor and automobile building industries. The concern is making a specialty of pistons. Machine work is also being done on large quantities of aluminum, cast iron and steel parts of various kinds.

Luther Grinder Co. Busy—The Luther Grinder Mfg. Co., 285 South Water Street, Milwaukee, is making large shipments of tool grinders and similar specialties for export to South Africa, India and South America. The domestic demand is the best the company has ever experienced, and the six-story factory is working night and day. The combination garage grinder is being produced in large quantities to meet the demand from jobbers.

Dodge Has 100 Carloads of Freight Daily—An average of 100 carloads of freight forms the daily incoming freight now at the Dodge Bros., Detroit, Mich., plant. This freight includes generally 400 tons of coal for the steam boilers, 15,000 gal. of fuel oil for the heat treating plants, 225,000 lb. of steel for parts, 30,000 lb. of brass for the brass foundry, 10,000 lb. of aluminum for the aluminum foundry, 55 tons of pig iron for the gray iron foundry and 6 tons of sand for the foundries.

The Automobile Calendar

Nov. 29-Dec. 4....Electric Prosperity Week.
Dec. 5.....Worcester, Mass., American Road Builders' Assn. Day.
Dec. 6-11.....Springfield, Mass., Show, Auditorium.
Dec. 7-10.....New York City, American Society of Mechanical Engineers Convention.
Dec. 31-Jan. 8....New York City, Sixteenth Annual National Automobile Show; Grand Central Palace; National Automobile Chamber of Commerce.

1916

Jan. 1.....Springfield, Mo., Show, Springfield Motor Car Dealers' Assn.
Jan. 3-9.....Importers' Salon, Hotel Astor.
Jan. 5-6.....New York City, S. A. E. Winter Session. Standards Committee Meeting.
Jan. 7, 8, 10, 11...New York City, Convention National Assn. of Automobile Accessory Jobbers.
Jan. 7-13.....Milwaukee, Wis., Show, Auditorium.
Jan. 8-15.....Cleveland, Ohio, Show, Wigmore Coliseum, Cleveland Automobile Show Co.
Jan. 8-15.....Philadelphia, Pa., Show, Philadelphia Auto. Trade Assn.
Jan. 14-22.....Dayton, O., Show, Delco Bldg., Dayton Automobile Dealers' Assn., and Dayton Accessory Dealers' Assn.
Jan. 10-15.....New Bedford, Mass., Show, State Armory.
Jan. 15-22.....Detroit, Mich., Show, Detroit Automobile Dealers' Assn.
Jan. 17-22.....Rochester, N. Y., Show, Exposition Park, C. A. Simmons, Mgr.
Jan. 17-22.....Wilmington, Del., Show, Wilmington Automobile Show Assn.
Jan. 18-22.....Baltimore, Md., Show, Fifth Regiment Armory.
Jan. 18-22.....Lancaster, Pa., Show, Conestoga Park Pavilion.
Jan. 22-29.....Montreal, Que., Show, Almy's Bldg., Automobile Trade Assn., Ltd.
Jan. 22-29.....Chicago, Ill., Show, National Automobile Chamber of Commerce; Coliseum and First Regiment Armory.
Jan. 23-30.....Portland, Ore., Show, Portland Automobile Dealers' Trade Assn.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb. 5....Columbus, Ohio, Show, Memorial Hall, Columbus Automobile Show Co.
Jan. 29-Feb. 5....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12.....Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 9-12.....Peoria, Ill., Show, Coliseum. Peoria Automobile and Accessory Assn.
Feb. 14-19.....Des Moines, Ia., Show, Des Moines Auto. Dealers' Assn.
Feb. 19.....Newark, N. J., Show.
Feb. 20-27.....Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Feb. 21-26.....Louisville, Ky., Show, First Regiment Armory.
Feb. 21-26.....Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 21-26.....Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Feb. 29-Mar. 4....Ft. Dodge, Ia., Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March 4-11.....Boston, Mass., Car and Truck Show, Mechanics Bldg.
March 21-25.....Deadwood, S. D., Show, Auditorium, Deadwood Business Club.
Mar. 28-Apr. 3....Manchester, N. H., Show, Under Auspices Couture Bros. Academy.
May 13.....New York City, Sheepshead Bay Speedway Race.
May 30.....Indianapolis Track Race.
June 17.....Chicago Track Race.
June 28.....Des Moines, Ia., Track Race.
July 4.....Minneapolis Track Race.
July 4.....Sioux City Track Race.
July 15.....Omaha, Neb., Track Race.
Aug. 5.....Tacoma Track Race.
Aug. 18-19.....Elgin Road Race.
Sept. 4.....Des Moines Track Meet.
Sept. 15.....Indianapolis Track Race.
Sept. 16.....Providence Track Race.
Sept. 30.....New York City Sheepshead Bay Race.
Oct. 7.....Omaha Track Race.
Oct. 14.....Chicago Track Race.

The Week in the Industry

Bunnell Paige Rep.—Marc Bunnell, formerly with the Chalmers company, has assumed the duties of Southern Cal. factory representative of the Paige-Detroit Motor Car Co.

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Dealers

Studebaker Opens in Bronx—Reed & Reed, Inc., have taken the Studebaker agency for Bronx County, New York, and have moved into a showroom at 361 East 149th Street. The building measures 30 by 90 ft. A service station has also been opened.

Foster Opens Denver Supply House—The Foster Auto Supply Co. is the name under which a new accessory business will be opened in December at 138 Sixteenth Street, Denver, by J. W. Foster, formerly manager of the Denver Auto Goods Co.

To Distribute Spranger Wheel—The P. M. Lewis Co., with headquarters at 423 Grand River Avenue, Detroit, has been organized and has been appointed distributor for the Spranger Rim & Wheel Co. The members of the company are P. M. Lewis, E. A. Tomes, F. V. Haddas and George Gagnier.

Late Baltimore Trade Items—W. A. Marburg of A, 32 South Street, Baltimore, Md., has taken the agency of the Fox shock absorber for Maryland and the northern part of Virginia.

The Baltimore Buggy Top Co., 107 to 113 West Mount Royal Avenue, Baltimore, which handles automobile supplies and does automobile repairing, will build a 76 by 124 by 49 ft. addition to its present plant. It will be a one-story structure of brick.

The Service Co., Bank and Fifth Streets, Highlandtown, Md., distributor of Goodyear truck tires, has moved to 1209 Lovegrove alley, Baltimore.

H. C. Clark and Frank Hodinott, who comprise the Motorcar Accessory Co., 1201 North Charles Street, Baltimore, has taken the agency for a safeguard valve device for automobiles turned out by the Fire Prevention Co., Providence, R. I.

The Tire Mart, 1419 North Charles Street, Baltimore, of which F. M. Boyd is manager, has been appointed State distributor of the Jovo tire seal.

The Gilson Sales Co., Cathedral Street, near Chase Street, Baltimore, is now the distributor of Kor Ker, the new puncture cure manufactured by the Alcemo Co., Newark, N. J.

Motor Men in New Roles

Hurst Makes Change—C. F. Hurst, who has been district representative for Dodge Bros., with headquarters at Omaha, is now with the King Motor Car Co. in the same position and territory.

Cooke Joins National Rubber—E. W. Cooke, until recently sales manager of the American Tire and Rubber Co., Akron, Ohio, has joined the National Rubber Co., Pottstown, Pa., as assistant sales manager.

Carter Resigns—L. J. Carter, until recently in charge of retail sales for the Studebaker company in Saginaw, Mich., has resigned to become sales manager for the Peck Auto Sales Co., Studebaker dealer in Grand Rapids, Mich.

Baird Joins N. Y. Saxon—F. S. Baird has become retail sales manager of the Saxon Motor Co. of New York. He was formerly with the Chevrolet Motor Co. in the sales department. H. C. Turner has also joined the New York branch, coming from the Saxon factory.

Case Goes to Scripps-Booth—Julian C. Case, until recently assistant advertising manager of the Paige-Detroit Motor Car Co., Detroit, Mich., has resigned to become assistant advertising manager of the Scripps-Booth Co., manufacturer of the Scripps-Booth automobiles.

Cartmell Kelly-Springfield Tire Mgr.—R. P. Cartmell, Los Angeles, Cal., has been appointed manager of the Southern California branch of the Kelly-Springfield Tire Co., to succeed C. A. Jessup, who goes to Cleveland to become manager of the Kelly-Springfield branch there, which controls Buffalo, Indianapolis, Columbus and Toronto.

Franklin Detroit King Mgr.—As a result of a meeting of the directors and stockholders of the A. A. Crumley Co., Detroit, the name of the concern is to be changed to the King-Dort Sales Co. A. A. Crumley, president and general manager of the A. A. Crumley Co. is not connected with the new company. G. W. Franklin, who was sales manager of the Crumley company, becomes general manager of the new company.

Cochran Frisco Cole Mgr.—W. B. Cochran has re-entered the automobile field and will distribute the Cole through northern California. The new company is headed by A. B. Emanuel, while Mr. Cochran is vice-president and general manager. The firm will be known as the Cole-Pacific Motor Co. and has headquarters in San Francisco, which formerly were occupied by the Rauch & Lang dealer.

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Dealer

Minneapolis Companies Build—The Pence Automobile Co., Minneapolis, Minn., will erect a new building for the Buick car extending on Tenth Street from Hennepin to Hawthorn Avenue and to cost $250,000. The present eight-story Pence-Buick building will be leased for a department store. The new building will be 308 ft. long and four stories. It will be an accessory store center in space not occupied by the owner company.

The Willard Storage Battery Co., Plymouth building, has arranged to erect a two-story building, 60 by 150 ft., to be ready in 3 months. It will be headquarters for N. G. Wolf, managing the Dokotas, Montana, Minnesota and Northwestern Canada. H. S. Greiner will be local manager. Temporary quarters were opened Nov. 20 at 1301 Nicollet Avenue.

The Northwest Automobile Co. has been formed to wholesale Hupmobile cars in Minnesota, North Dakota, Eastern Montana and Western Wisconsin, S. D. Briggs, formerly with the Pence Automobile Co., is manager. Headquarters are at 620 Third Street S. The local agency for the Hupmobile is the Zolle Co., 220 Sixth Street S., which has given up the Pathfinder agency to the John P. Snyder Co., 407 Tenth Street S.

Recent Philadelphia Trade Items—The Stoever-Hannold Co., Philadelphia, Pa., distributer of the Jackson, has removed from 833 North Broad Street to larger quarters at 923 North Broad Street.

The Prest-O-Lite Co. has opened a service station for the charging and repairing of storage batteries at its local branch, 1418 Race Street.

The agency for the National car, in the Metropolitan Building, Philadelphia, has come into new ownership, Raymond Hawley of Riverton, N. J., taking complete charge. Associated with Mr. Hawley will be W. L. Conner, who will assume charge of the sales and service departments. The agency will cover this State, New Jersey and Delaware.

A complete stock of automobile accessories has been added to the sporting goods business of Moskowitz & Herbach, 430 Market Street, Philadelphia.